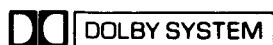


# Service Manual

**dbx** Equipped Stereo Cassette Deck  
with Soft-Touch Controls and  
Peak Hold FL Meters

Cassette Deck  
**RS-M240X**  
(Silver Face)  
(Black Face)



This is the Service Manual for the following areas.

- ☐ ..... For all European areas except United Kingdom.
- ☐ ..... For Asia, Latin America, Middle East and Africa areas.
- ☐ ..... For Australia.

## RS-M24 MECHANISM SERIES

### Specifications

Track system:	4-track 2-channel stereo recording and playback	Inputs:	MIC; sensitivity 0.25 mV, input impedance 47 k $\Omega$ applicable microphone impedance 400 $\Omega$ —10 k $\Omega$
Tape speed:	4.8 cm/s		LINE; sensitivity 60 mV, input impedance 47 k $\Omega$
Wow and flutter:	0.048% (WRMS), $\pm 0.14\%$ (DIN)	Outputs:	LINE; output level 400 mV, output impedance 1.5 k $\Omega$ or less, load impedance 22 k $\Omega$ over
Frequency response:	Metal tape; 20—18,000 Hz 30—17,000 Hz (DIN) 30—16,000 Hz $\pm 3$ dB		HEADPHONES; output level 80 mV, load impedance 8 $\Omega$
	CrO <sub>2</sub> tape; 20—18,000 Hz 30—16,000 Hz (DIN) 30—16,000 Hz $\pm 3$ dB	Bias frequency:	80 kHz
	Normal tape; 20—17,000 Hz 30—15,000 Hz (DIN) 30—14,000 Hz $\pm 3$ dB	Motor:	Electronically controlled DC motor
Dynamic range:	dbx in; 110 dB (at 1 kHz)	Heads:	2-head system 1-SX head for record/playback 1-double-gap ferrite head for erasure
Max. input level:	10 dB or more improved with dbx in (at 1 kHz)	Power requirement:	AC; 110/125/220/240 V, 50-60 Hz
Signal-to-noise ratio:	dbx in; 91 dB Dolby NR in; 67 dB (above 5 kHz) Dolby NR out; 57 dB (signal level = peak level a weighted, CrO <sub>2</sub> type tape)	Preset power voltage:	<input type="checkbox"/> ..... 220 V <input type="checkbox"/> ..... 240 V
Fast forward and rewind time: Approx. 90 seconds with C-60 cassette tape		Power consumption:	<input type="checkbox"/> ..... 15 W <input type="checkbox"/> ..... 13 W
		Dimensions:	43.0 cm (W) $\times$ 11.9 cm (H) $\times$ 24.6 cm (D)
		Weight:	4.6 kg

Specifications are subject to change without notice.

\* The term dbx is a registered trademark of dbx Inc.

\*\* 'Dolby' and the double-D symbol are trademarks of Dolby Laboratories.

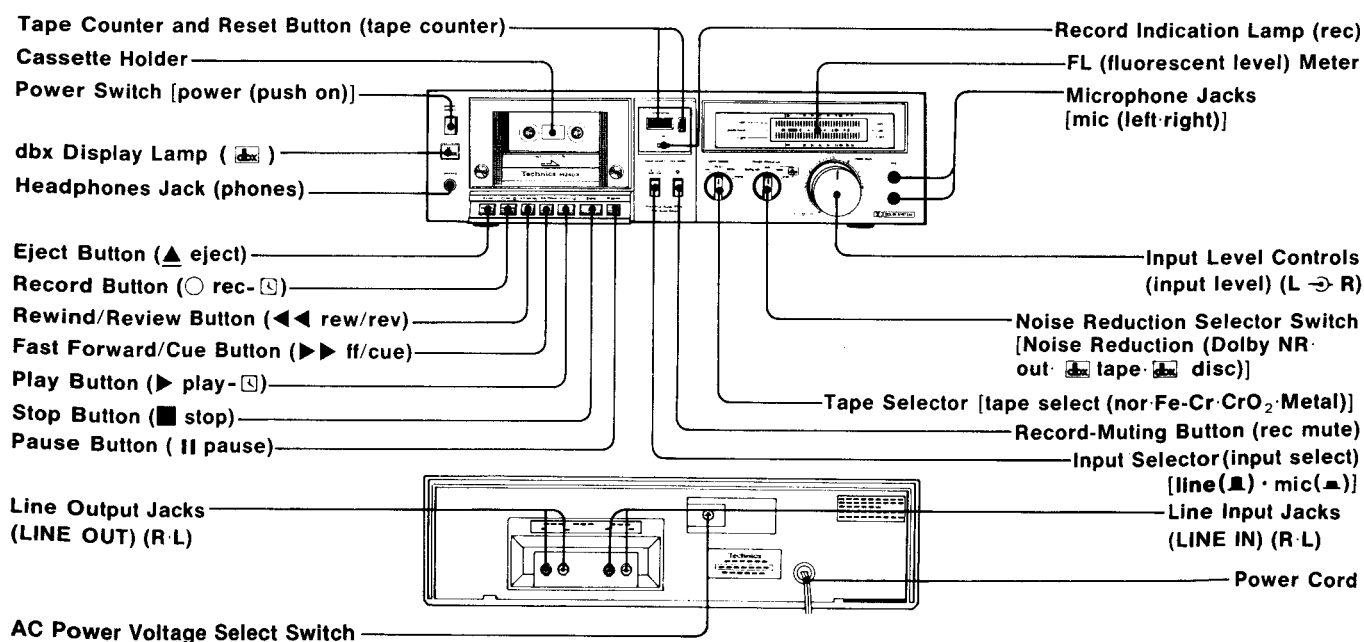
# Technics

**Matsushita Electric Trading Co., Ltd.**  
P.O. Box 288, Central Osaka Japan

# CONTENTS

ITEM	PAGE
LOCATION OF CONTROLS AND COMPONENTS .....	1
DISASSEMBLY INSTRUCTIONS .....	2
MEASUREMENT AND ADJUSTMENT METHODS (WITHOUT dbx SYSTEM) .....	3
OUTLINE OF dbx SYSTEM .....	9
THE BLOCK DIAGRAM OF dbx SYSTEM .....	10
MEASUREMENT AND ADJUSTMENT METHODS (FOR dbx SYSTEM) .....	11
• TROUBLESHOOTING CHART FOR dbx SYSTEM .....	11
• ADJUSTMENT PARTS LOCATION OF dbx SYSTEM .....	12
• SIGNAL WAVE FORMS AT INDIVIDUAL SECTIONS OF THE RMS DETECTOR CIRCUIT & VCA CIRCUIT .....	12
• dbx SYSTEM CHECKING METHOD .....	12
• ADJUSTMENT OF dbx SYSTEM .....	12
• CHECKING PROCEDURE FOR PROBLEMS .....	13
HOW TO REPAIR PRINTED RESISTORS .....	14
ELECTRICAL PARTS LOCATION .....	14
SCHEMATIC DIAGRAM (MAIN AMP SECTION) .....	15
CIRCUIT BOARDS (MAIN AMP/FL METER SECTION) .....	16
SCHEMATIC DIAGRAM (dbx SECTION) .....	17
CIRCUIT BOARD (dbx SECTION) .....	18
WIRING CONNECTION DIAGRAM .....	18
MECHANICAL PARTS LOCATION .....	19
CABINET PARTS LOCATION .....	19

## LOCATION OF CONTROLS AND COMPONENTS



# DISASSEMBLY INSTRUCTIONS

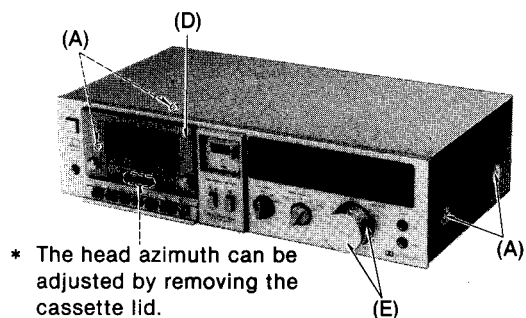


Fig. 1

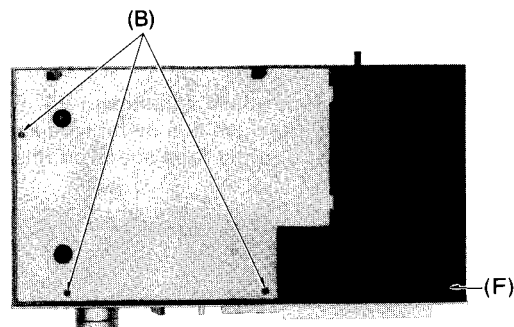


Fig. 2

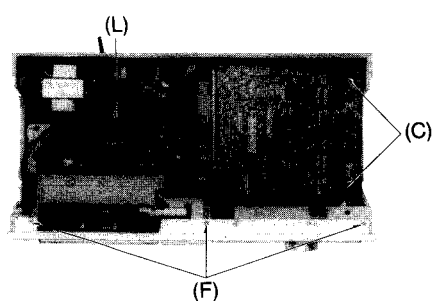


Fig. 3



Fig. 4

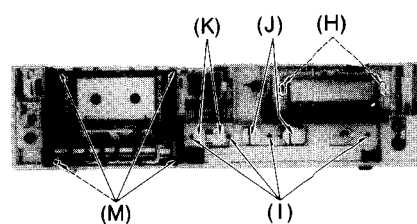


Fig. 5

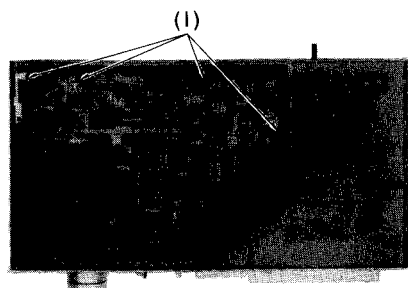


Fig. 6

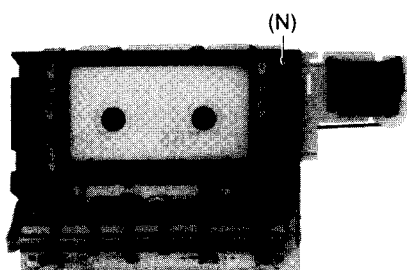


Fig. 7

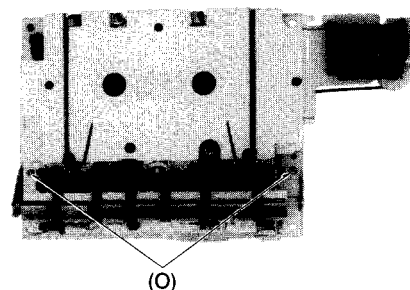


Fig. 8

Ref. No.	Procedure	To remove —	Remove —	Shown in fig. —
1	1	Case cover	• 4 screws ..... (A)	1
2	2	Bottom cover	• 3 screws ..... (B)	2
3	1→3	dbx circuit board	• 2 red screws..... (C)	3
4	1→2→4	Front panel	• Cassette lid ..... (D) • 2 volume knobs ..... (E) • 4 screws ..... (F)	1 1 2, 3
5	1→2→4→5	FL meter	• Meter cover ..... (G) • 2 meter holders ..... (H)	4 5
6	1→2→3→4→6	Main circuit board	• 8 red screws..... (I) • 2 select knobs ..... (J) • 2 push buttons ..... (K) • Recording wire ..... (L)	5, 6 5 5 3
7	1→2→4→7	Mechanism unit	• 4 red screws..... (M)	5
8	1→2→4→7→8	Operation button unit	• Cassette holder..... (N) • 2 screws ..... (O)	7 8

# MEASUREMENT AND ADJUSTMENT METHODS

## • CIRCUIT BOARDS AND ADJUSTMENT PARTS LOCATION (WITHOUT dbx SYSTEM)

### Tape speed adjustment VR

Please use non metal type screwdriver when you adjust tape speed on this unit.

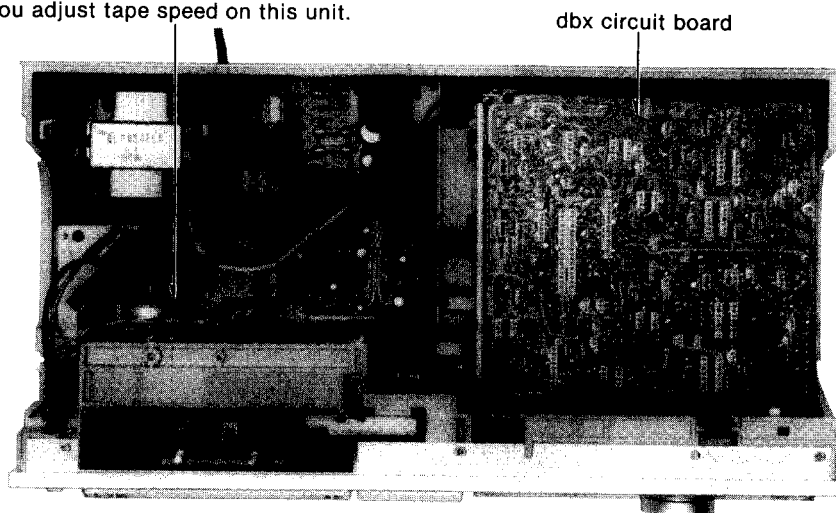


Fig. 1

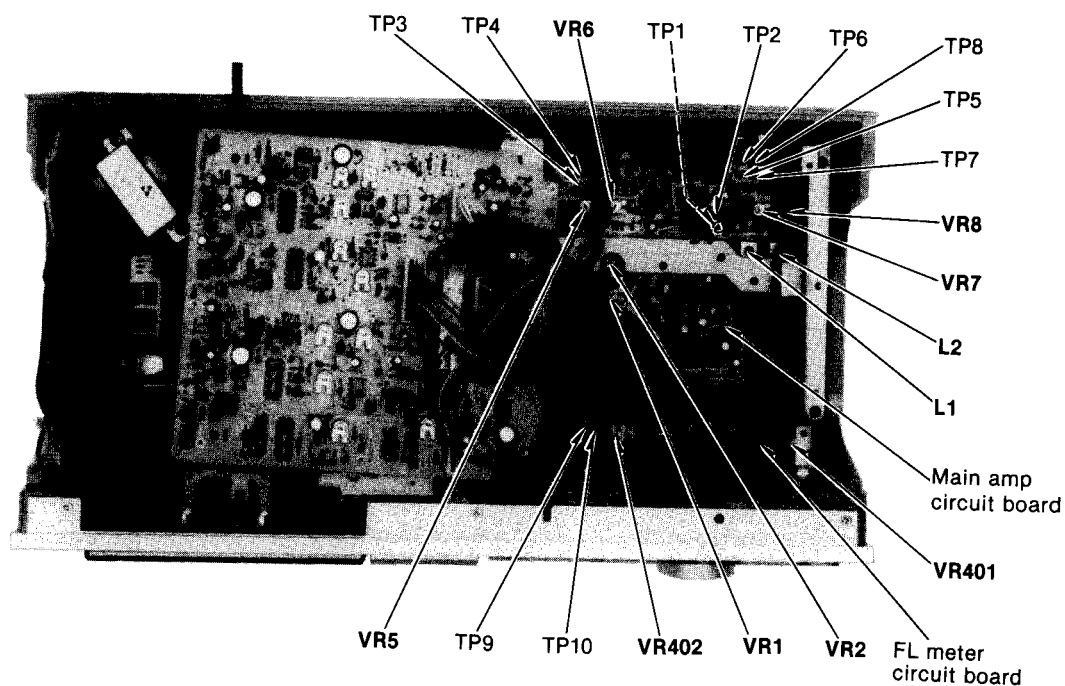


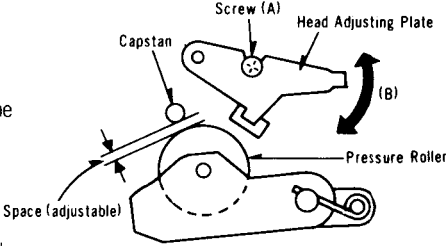
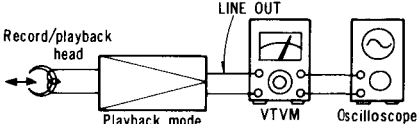
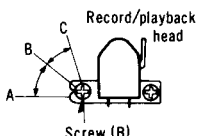
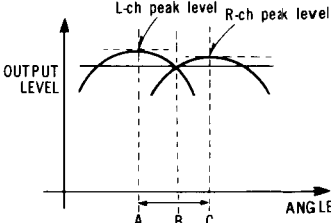
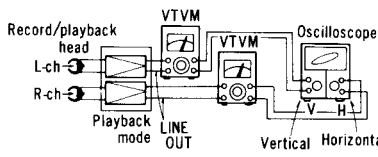
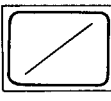
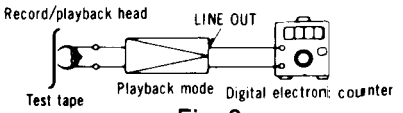
Fig. 2

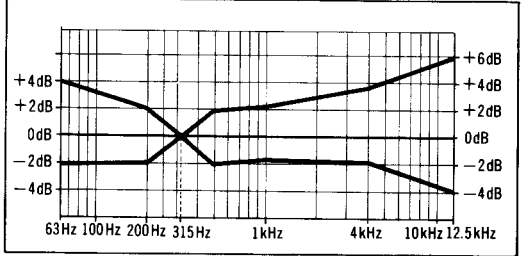
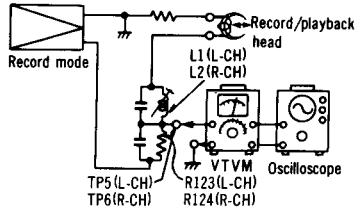
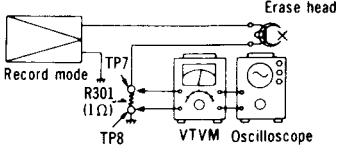


## • MEASUREMENT AND ADJUSTMENT METHODS

**NOTES:** Keep good condition, set switches and controls in the following positions, unless otherwise specified.

- Make sure heads are clean.
- Make sure capstan and pressure roller are clean.
- Judgeable room temperature:  $20 \pm 5^{\circ}\text{C}$  ( $68 \pm 9^{\circ}\text{F}$ )
- NR switch: OUT
- Tape selector: Normal position
- Input selector: Line in
- Input level controls: Maximum

ITEM	MEASUREMENT & ADJUSTMENT
<p><b>A Head position adjustment</b></p> <p>Condition:</p> <ul style="list-style-type: none"> <li>• Playback and pause mode</li> </ul>	<p>(The head adjusting plate is provided to adjust the tape touch of the head in cue or review mode.)</p> <ol style="list-style-type: none"> <li>Press the playback button and pause button.</li> <li>Measure the space between the pressure roller and the capstan.</li> </ol> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <b>Standard value: <math>0.5 \pm 0.3\text{mm}</math></b> </div> <ol style="list-style-type: none"> <li>If the measured value is not within the standard value, untighten screw (A), and slide the head adjusting plate in the direction of arrow (B) for adjustment.</li> </ol>  <p style="text-align: center;"><b>Fig. 3</b></p>
<p><b>B Head azimuth adjustment</b></p> <p>Condition:</p> <ul style="list-style-type: none"> <li>• Playback mode</li> </ul> <p>Equipment:</p> <ul style="list-style-type: none"> <li>• VTVM • Oscilloscope</li> <li>• Test tape (azimuth) ... QZZCFM</li> </ul>	<p><b>L-ch/R-ch output balance adjustment</b></p> <ol style="list-style-type: none"> <li>Make connections as shown in fig. 4.</li> </ol>  <p style="text-align: center;"><b>Fig. 4</b></p> <ol style="list-style-type: none"> <li>Playback the 8kHz signal from the test tape (QZZCFM). Adjust screw (B) in fig. 5 for maximum output L-ch and R-ch levels. When the output levels of L-ch and R-ch are not at maximum at the same time, readjust as follows.</li> <li>Turn the screw shown in fig. 5 to find angles A and C (points where peak output levels for left and right channels are obtained). Then, locate the angle B between angles A and C, i.e., a point where L-ch and R-ch output levels come together at maximum. (Refer to figs. 5 and 6.)</li> </ol>  <p style="text-align: center;"><b>Fig. 5</b></p>  <p style="text-align: center;"><b>Fig. 6</b></p> <p><b>L-ch/R-ch phase adjustment</b></p> <ol style="list-style-type: none"> <li>Make connections as shown in fig. 7.</li> <li>Playback the 8kHz signal from the test tape (QZZCFM). Adjust screw (B) shown in fig. 5 so that pointers of the two VTVMs swing to maximum and a waveform as illustrated in fig. 8 is obtained on the oscilloscope.</li> </ol>  <p style="text-align: center;"><b>Fig. 7</b></p>  <p style="text-align: center;"><b>Fig. 8</b></p>
<p><b>C Tape speed</b></p> <p>Condition:</p> <ul style="list-style-type: none"> <li>• Playback mode</li> </ul> <p>Equipment:</p> <ul style="list-style-type: none"> <li>• Digital electronic counter or frequency counter</li> <li>• Test tape ... QZZCWAT</li> </ul>	<p><b>Tape speed accuracy</b></p> <ol style="list-style-type: none"> <li>Test equipment connection is shown in fig. 9.</li> <li>Playback test tape (QZZCWAT 3,000Hz), and supply playback signal to frequency counter.</li> <li>Take measurement at middle section of tape.</li> <li>Measure this frequency.</li> <li>On the basis of 3,000Hz, determine value by following formula:</li> </ol> $\text{Tape speed accuracy} = \frac{f - 3,000}{3,000} \times 100 (\%) \quad \text{where, } f = \text{measured value}$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <b>Standard value: <math>\pm 1.5\%</math></b> </div> <p><b>Adjustment method</b></p> <ol style="list-style-type: none"> <li>Playback the test tape (middle).</li> <li>Adjust so that frequency becomes 3,000Hz.</li> <li>Tape speed adjustment VR shown in fig. 1.</li> </ol>  <p style="text-align: center;"><b>Fig. 9</b></p>

ITEM	MEASUREMENT & ADJUSTMENT
	<p><b>Tape speed fluctuation</b></p> <p>Make measurements in same manner as above (beginning, middle and end of tape), and determine the difference between maximum and minimum values and calculate as follows:</p> $\text{Tape speed fluctuation} = \frac{f_1 - f_2}{3,000} \times 100 (\%) \quad f_1 = \text{maximum value, } f_2 = \text{minimum value}$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <b>Standard value: Less than 1%</b> </div> <p><b>Note:</b> Please use non metal type screwdriver when you adjust tape speed accuracy on this unit.</p>
<p><b>Ⓓ Playback frequency response</b></p> <p>Condition:</p> <ul style="list-style-type: none"> <li>• Playback mode</li> <li>• Tape selector ... Normal position</li> </ul> <p>Equipment:</p> <ul style="list-style-type: none"> <li>• VTVM</li> <li>• Oscilloscope</li> <li>• Test tape... QZZCFM</li> </ul>	<ol style="list-style-type: none"> <li>1. Test equipment connection is shown in fig. 4.</li> <li>2. Place UNIT into playback mode.</li> <li>3. Playback the frequency response test tape (QZZCFM).</li> <li>4. Measure output level at 315Hz, 12.5kHz, 8kHz, 4kHz, 1kHz, 250Hz, 125Hz and 63Hz, and compare each output level with the standard frequency 315Hz, at LINE OUT.</li> <li>5. Make measurement for both channels.</li> <li>6. Make sure that the measured value is within the range specified in the frequency response chart (shown in fig. 10).</li> </ol> <div style="text-align: right;"> <b>Playback frequency response chart</b>   </div> <p style="text-align: right;"><b>Fig. 10</b></p>
<p><b>Ⓔ Playback gain</b></p> <p>Condition:</p> <ul style="list-style-type: none"> <li>• Playback mode</li> <li>• Tape selector ... Normal position</li> </ul> <p>Equipment:</p> <ul style="list-style-type: none"> <li>• VTVM</li> <li>• Oscilloscope</li> <li>• Test tape... QZZCFM</li> </ul>	<ol style="list-style-type: none"> <li>1. Test equipment connection is shown in fig. 4.</li> <li>2. Playback standard recording level portion on test tape (QZZCFM 315Hz), and using VTVM measure the output level at LINE OUT.</li> <li>3. Make measurement for both channels.</li> </ol> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <b>Standard value: 0.42V ± 2dB</b>  <b>[around 0.42V: at test points TP3 (L-CH) and TP4 (R-CH)]</b> </div> <p><b>Adjustment</b></p> <ol style="list-style-type: none"> <li>1. If measured value is not within standard, adjust VR1 (L-CH), VR2 (R-CH) (See fig. 2 on page 3).</li> <li>2. After adjustment, check "Playback frequency response" again.</li> </ol>
<p><b>Ⓕ Bias leakage</b></p> <p>Condition:</p> <ul style="list-style-type: none"> <li>• Record mode</li> <li>• Input level controls... MAX</li> <li>• Tape selector ... Metal position</li> </ul> <p>Equipment:</p> <ul style="list-style-type: none"> <li>• VTVM</li> <li>• Oscilloscope</li> </ul>	<ol style="list-style-type: none"> <li>1. Test equipment connection is shown in fig. 11.</li> <li>2. Press the record and playback buttons.</li> <li>3. Adjust trap coils L1 (L-CH), L2 (R-CH), so that measured value becomes minimum.</li> <li>4. Make adjustment for both channels.</li> </ol> <div style="text-align: right;">  </div> <p style="text-align: right;"><b>Fig. 11</b></p>
<p><b>Ⓖ Erase current</b></p> <p>Condition:</p> <ul style="list-style-type: none"> <li>• Record mode</li> <li>• Tape selector ... Metal position</li> </ul> <p>Equipment:</p> <ul style="list-style-type: none"> <li>• VTVM</li> <li>• Oscilloscope</li> </ul>	<ol style="list-style-type: none"> <li>1. Test equipment connection is shown in fig. 12.</li> <li>2. Press the record and pause buttons.</li> <li>3. Set the tape selector to metal position.</li> <li>4. Read voltage on VTVM and calculate erase current by following formula:</li> </ol> $\text{Erase current (A)} = \frac{\text{Voltage across both ends of R301}}{1 (\Omega)}$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <b>Standard value: 155 ± 15mA (Metal position)</b> </div> <p>5. If measured value is not within standard, adjust as follows.</p> <p><b>Adjustment</b></p> <ol style="list-style-type: none"> <li>1. Open the point (A) and short the point (B) on the main circuit board in the circuit board diagram (See page 16).</li> <li>2. Make measurement for erase current.</li> <li>3. Make sure that the measured value is within the erase current of 140mA to 170mA.</li> <li>4. If it is beyond the value, carry out the following adjustments: <ul style="list-style-type: none"> <li>• If the erase current is less than 140mA, short the point (A).</li> <li>• If the erase current is more than 170mA, open the points (A) and (B).</li> </ul> </li> </ol> <div style="text-align: right;">  </div> <p style="text-align: right;"><b>Fig. 12</b></p>

## ITEM

## MEASUREMENT &amp; ADJUSTMENT

### Overall frequency response

Condition:

- \* Record/playback mode
- \* Tape selector
  - ... Normal position
  - ... CrO<sub>2</sub> position
  - ... Fe-Cr position
  - ... Metal position
- \* Input level controls ... MAX

Equipment:

- \* VTVM      \* AF oscillator
- \* ATT      \* Oscilloscope
- \* Resistor (600Ω)
- \* Test tape  
(reference blank tape)
  - ... QZZCRA for Normal
  - ... QZZCRX for CrO<sub>2</sub>
  - ... QZZCRY for Fe-Cr
  - ... QZZCRZ for Metal

#### Note 1:

Before measuring and adjusting, make sure of the playback frequency response (For the method of measurement, please refer to the playback frequency response).

#### Note 2:

Test tape QZZCRA to be supplied after July 1980 has higher recording sensitivity in the middle and high frequency range.

#### Overall frequency response chart (Normal)

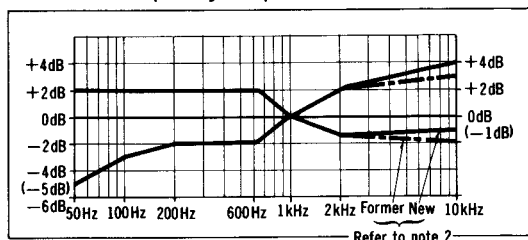
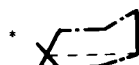


Fig. 13

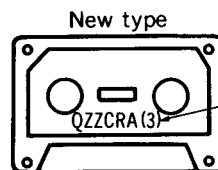
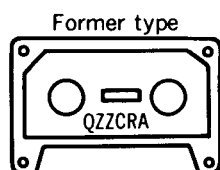


This chart indicates the standard values for the new type of QZZCRA when in use.



This chart indicates the standard values for the former type of QZZCRA when in use.

The new type of QZZCRA is marked as shown in fig. 14.



Marking

Fig. 14

#### Overall frequency response adjustment by recording bias current

##### Note 1:

On RS-M240X, overall frequency response is adjusted with tape selector set at Normal.

##### Note 2:

Recording equalizer is fixed.

1. Make connections as shown in fig. 15.
2. Input a 1 kHz, -24 dB signal through LINE IN.  
Place the set in record mode.
3. Fine adjust the attenuator to obtain 0.42 V LINE OUT output.  
\* Make sure that the input signal level is  $-24 \pm 4$  dB with 0.42 V output voltage.

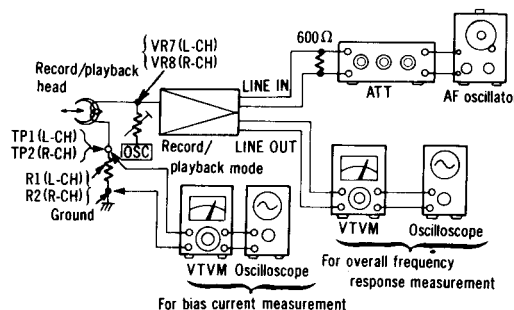


Fig. 15

4. Set the tape selector to Normal, and load the test tape (QZZCRA).
5. Adjust the attenuator to reduce the input signal level by 20 dB.
6. Adjust the AF oscillator to generate 50 Hz, 100 Hz, 200 Hz, 500 Hz, 1 kHz, 4 kHz, 8 kHz and 10 kHz signals, and record these signals on the test tape.
7. Playback the signals recorded in step 6, and check if the frequency response curve is within the limits shown in the overall frequency response chart for Normal tapes (fig. 13).  
(If the curve is within the charted specifications, proceed to steps 8, 9 and 10.)

If the curve is not within the charted specifications, adjust as follows;

#### Adjustment (A):

When the curve exceeds the overall frequency response chart specifications (fig. 13) as shown in fig. 16.

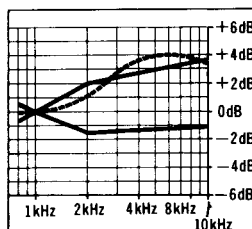


Fig. 16

#### Adjustment (B):

When the curve falls below the overall frequency response chart specifications (fig. 13) as shown in fig. 17.

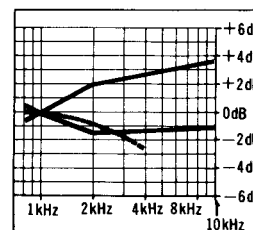


Fig. 17

ITEM	MEASUREMENT & ADJUSTMENT		
	<div data-bbox="539 271 962 533"> <ol style="list-style-type: none"> <li>1) Increase bias current by turning VR7 (L-CH) and VR8 (R-CH). (See fig. 2 on page 3.)</li> <li>2) Repeat steps 6 and 7 to confirm. (Proceed to steps 8, 9 and 10 if the curve is now within the charted specifications in fig. 13).</li> <li>3) If the curve still exceeds the specifications (fig. 13), increase bias current further and repeat steps 6 and 7.</li> </ol> </div> <div data-bbox="1017 271 1440 510"> <ol style="list-style-type: none"> <li>1) Reduce bias current by turning VR7 (L-CH) and VR8 (R-CH).</li> <li>2) Repeat steps 6 and 7 to confirm. (Proceed to steps 8, 9 and 10 if the curve is now within the charted specifications in fig. 13.)</li> <li>3) If the curve still falls below the charted specifications (fig. 13), reduce bias current further and repeat steps 6 and 7.</li> </ol> </div> <div data-bbox="503 577 1425 707"> <p>8. Switch the tape selector to CrO<sub>2</sub>, change test tape to QZZCRX, and record 50Hz, 100Hz, 200Hz, 500Hz, 1kHz, 4kHz, 8kHz, 10kHz and 12.5kHz signals. Then, playback the signals and check if the curve is within the limits shown in the overall frequency response chart for CrO<sub>2</sub> tapes (fig. 18).</p> <div data-bbox="900 685 1425 916"> </div> </div> <div data-bbox="503 757 884 969"> <p>9. Switch the tape selector to Fe-Cr, change test tape to QZZCRY, and record 50Hz, 100Hz, 200Hz, 500Hz, 1kHz, 4kHz, 8kHz, 10kHz and 12.5kHz signals. Then, playback the signals and check if the curve is within the limits shown in the overall frequency response chart for Fe-Cr tapes (fig. 18).</p> </div> <div data-bbox="487 969 1425 1055"> <p>10. Switch the tape selector to Metal, change test tape to QZZCRZ, and record 50Hz, 100Hz, 200Hz, 500Hz, 1kHz, 4kHz, 8kHz, 10kHz and 12.5kHz signals. Then, playback the signals and check if the curve is within the limits shown in the overall frequency response chart for Metal tapes (fig. 18).</p> </div> <div data-bbox="487 1081 1393 1133"> <p>11. Confirm that bias currents are approximately as follows when the tape selector is set at different positions.</p> </div> <div data-bbox="539 1140 1190 1169"> <p>• Read voltage on VTVM and calculate bias current by following formula:</p> </div> <div data-bbox="597 1169 1001 1223"> <math display="block">\text{Bias current (A)} = \frac{\text{Value read on VTVM (V)}}{10 (\Omega)}</math> </div> <div data-bbox="555 1245 1386 1352"> <table border="1"> <tr> <td> <p>around 410μA (Normal position)  around 440μA (Fe-Cr position)  around 545μA (CrO<sub>2</sub> position)  around 800μA (Metal position)</p> </td> <td>: measured at TP1 (L-CH) and TP2 (R-CH)</td> </tr> </table> </div>	<p>around 410μA (Normal position)  around 440μA (Fe-Cr position)  around 545μA (CrO<sub>2</sub> position)  around 800μA (Metal position)</p>	: measured at TP1 (L-CH) and TP2 (R-CH)
<p>around 410μA (Normal position)  around 440μA (Fe-Cr position)  around 545μA (CrO<sub>2</sub> position)  around 800μA (Metal position)</p>	: measured at TP1 (L-CH) and TP2 (R-CH)		
<p>① Overall gain</p> <p>Condition:</p> <ul style="list-style-type: none"> <li>• Record/playback mode</li> <li>• Input level controls ... MAX</li> <li>• Standard input level; MIC ..... -72 ± 4 dB LINE IN ... -24 ± 4 dB</li> </ul> <p>Equipment:</p> <ul style="list-style-type: none"> <li>• VTVM</li> <li>• AF oscillator</li> <li>• ATT</li> <li>• Oscilloscope</li> <li>• Resistor (600Ω)</li> <li>• Test tape (reference blank tape) ... QZZCRA for Normal</li> </ul>	<ol style="list-style-type: none"> <li>1. Test equipment connection is shown in fig. 19.</li> <li>2. Place UNIT into record mode, and tape selector to Normal position.</li> <li>3. Supply 1kHz signal (-24 dB) from AF oscillator, through ATT to LINE IN.</li> <li>4. Adjust ATT until monitor level at LINE OUT becomes 0.42V.</li> <li>5. Using test tape, make recording.</li> <li>6. Playback recorded tape, and make sure the value at LINE OUT on VTVM becomes 0.42V.</li> <li>7. If measured value is not 0.42V, adjust VR5 (L-CH), VR6 (R-CH) (See fig. 2).</li> <li>8. Repeat from step 2.</li> </ol> <div data-bbox="1072 1442 1417 1688"> </div> <p style="text-align: center;">Fig. 19</p>		
<p>② Fluorescent meter</p> <p>Condition:</p> <ul style="list-style-type: none"> <li>• Record mode</li> <li>• Input level controls ... MAX</li> <li>• Tape selector ... Normal position</li> </ul>	<ol style="list-style-type: none"> <li>1. Test equipment connection is shown in fig. 19.</li> <li>2. As shown in fig. 20, connecting the base of Q402 and ground stops the oscillation of the astable multivibrator comprising Q402 and Q403.</li> <li>3. Supply 1kHz signal (-24 dB) to the LINE IN jack, then press the record button.</li> <li>4. Adjust the ATT so that the output level at LINE OUT jack becomes 0.42V (The input level at this condition is termed the standard input level).</li> </ol> <div data-bbox="1056 1805 1409 2024"> </div> <p style="text-align: center;">Fig. 20</p>		

ITEM	MEASUREMENT & ADJUSTMENT
<p>Equipment:</p> <ul style="list-style-type: none"> <li>• VTVM</li> <li>• ATT</li> <li>• Resistor (600 <math>\Omega</math>)</li> <li>• AF oscillator</li> <li>• Oscilloscope</li> </ul>	<ol style="list-style-type: none"> <li>Adjustment at "−20 dB":             <ol style="list-style-type: none"> <li>Adjust the ATT so that input level is −20 dB below standard recording level.</li> <li>Adjust VR401 so that the −20 dB segment lights up in the <math>-20 \pm 0.8</math> dB range (L-CH ONLY) (See fig. 22).</li> </ol> </li> <li>Adjustment at "0 dB":             <ol style="list-style-type: none"> <li>Adjust the ATT so that the output level at LINE OUT jack becomes 0.42 V. (The input level at this condition is termed the standard input level.)</li> <li>Adjust VR402 so that the +1 dB segment lights up in the <math>0 \pm 0.2</math> dB range of the standard input level (See fig. 22).</li> </ol> </li> <li>Repeat twice between steps 5 and 6 above.</li> <li>Adjust ATT and check that all segments light up when an input signal level is increased to 10 dB higher than the standard input level (See fig. 23).</li> </ol> <div data-bbox="937 324 1356 436" data-label="Figure"> </div> <p>Fig. 21</p> <div data-bbox="937 459 1356 571" data-label="Figure"> </div> <p>Fig. 22</p> <div data-bbox="937 593 1403 705" data-label="Figure"> </div> <p>Fig. 23</p>
<p>Ⓚ Dolby NR circuit</p> <p>Condition:</p> <ul style="list-style-type: none"> <li>• Record mode</li> <li>• NR switch ... Dolby IN/OUT</li> <li>• Input level controls ... MAX</li> </ul> <p>Equipment:</p> <ul style="list-style-type: none"> <li>• VTVM</li> <li>• ATT</li> <li>• Resistor (600 <math>\Omega</math>)</li> <li>• AF oscillator</li> <li>• Oscilloscope</li> </ul>	<ol style="list-style-type: none"> <li>Test equipment connection is shown in fig. 24.</li> <li>Place UNIT into record mode, set the NR switch to OUT position and supply to LINE IN to obtain −35 dB (17.5 mV) at TP3 (L-CH), TP4 (R-CH) (frequency 5 kHz).</li> <li>Confirm that the value at Dolby IN position is <math>8 \pm 2.5</math> dB greater than the value at Dolby OUT position of NR switch.</li> </ol> <div data-bbox="1011 806 1403 1064" data-label="Diagram"> </div> <p>Fig. 24</p>

## OUTLINE OF dbx SYSTEM

In 1971, the dbx company of Massachusetts, U.S.A., succeeded in developing a logarithmic compression/expansion system for audio signals which extends across an extremely wide amplitude range and results in a very low distortion rate.

In this system, the dynamic range of the input signal is compressed to 1/2 its original level (measured in decibels), and then recorded. The recorded signal is then expanded (2x) prior to playback, in order to restore it to the original level. By this process, a dynamic range exceeding 100dB can be easily obtained by using an ordinary tape recorder.

This system is referred to as a decilinear noise reduction system, but is generally called the "dbx system", the name being derived from the dbx company.

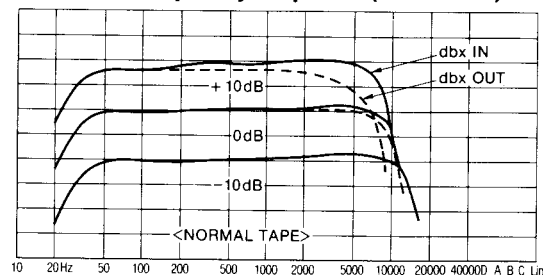
### • The features of the dbx system

1. A significant noise reduction (approximately 30dB or more) is obtained over the entire audible frequency range.

Noise reduction mode	S/N ratio RS-M240X	Remarks
Noise reduction "OUT"	58dB	CrO <sub>2</sub> tape, peak level
Dolby NR "IN"	66dB	CrO <sub>2</sub> tape, peak level
dbx "IN"	92dB	CrO <sub>2</sub> tape, peak level

2. A great improvement in the dynamic range makes it possible to extend the range to 110dB (at 1kHz, CrO<sub>2</sub> tape).
3. The direct logarithmic method of compression and expansion protects against problems caused by level mismatching.
4. Even if phase distortion occurs in the signal transmission system, precise operation is maintained by means of the RMS level detector.
5. A low distortion rate is maintained throughout the frequency range.
  - Improvement of high frequency response. The dbx system solves the problem of deteriorated high frequency at higher input levels which is an inherent fault of cassette tape equipment. The response at approx. 8,000Hz at 10dB input is improved as much as 14dB. As a result, flatter response is obtained at both low and high input levels.

Overall frequency response (RS-M240X)

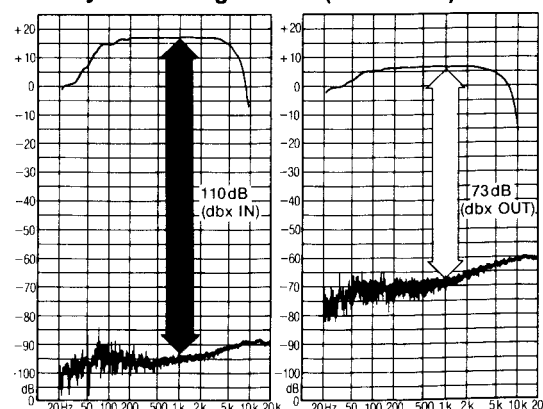


### • Remarkable dynamic range of 110dB

#### About dynamic range:

The dynamic range refers to the output range of an audio transmission system, extending from the lowest recognizable level to the highest possible level produced. Dynamic range is one of the values used to express the degree of fidelity of an audio transmission system.

Dynamic range: 1kHz (RS-M240X)

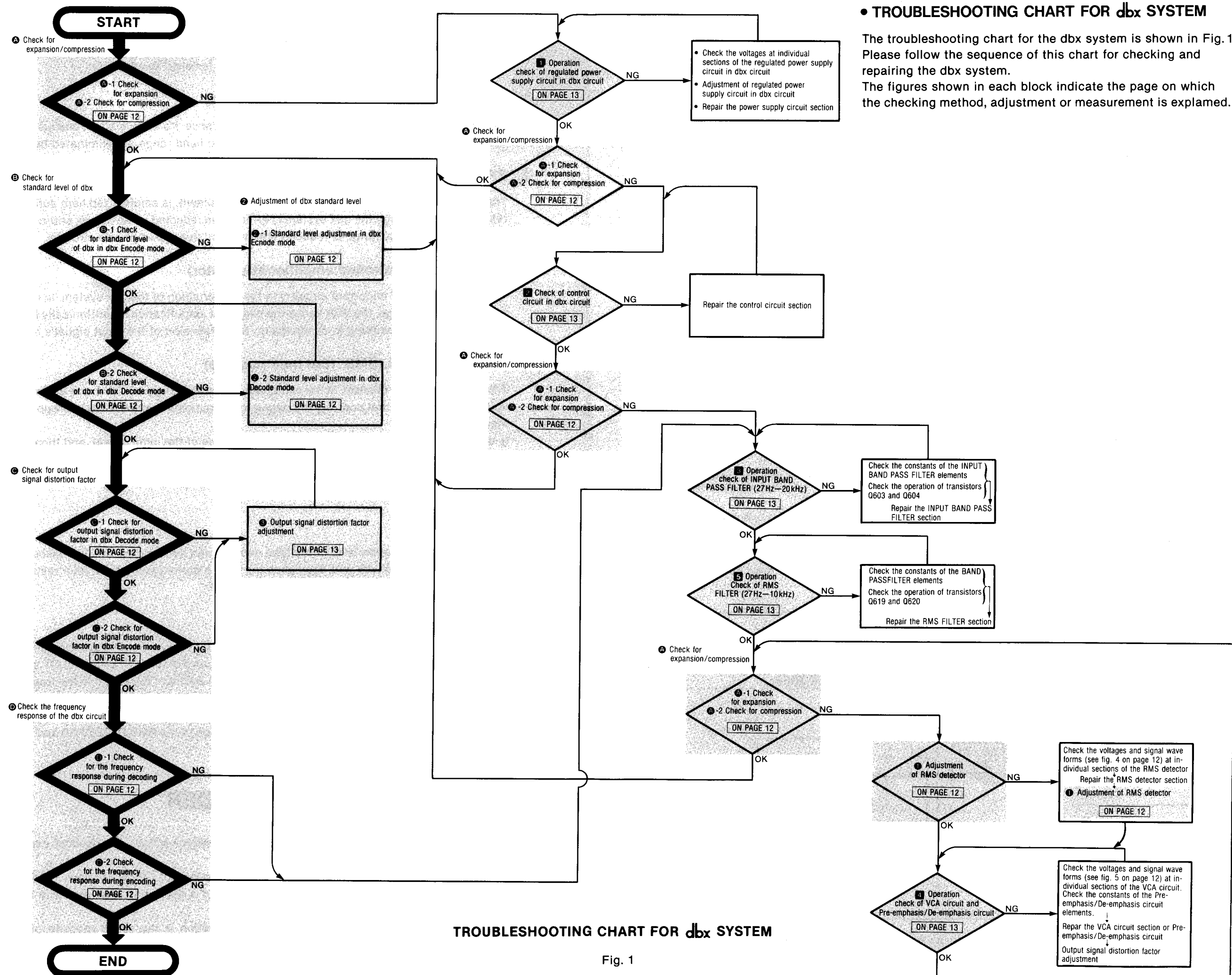


## MEASUREMENT AND ADJUSTMENT METHODS (FOR dbx SYSTEM)

## • TROUBLESHOOTING CHART FOR dbx SYSTEM

The troubleshooting chart for the dbx system is shown in Fig. 1. Please follow the sequence of this chart for checking and repairing the dbx system.

The figures shown in each block indicate the page on which the checking method, adjustment or measurement is explained.



TROUBLESHOOTING CHART FOR dbx SYSTEM

Fig. 1

- **Compressing the dynamic range to 1/2 before recording, and then expanding it (by 2x) before playback produces the remarkable dynamic range of the dbx system.**

- The dynamic range of cassette tape with a saturation level of +10dB and a noise level of -45dB (such as Technics CrO<sub>2</sub> position tape) is 55dB. Any sounds with a level greater than +10dB will result in considerable distortion, and any sounds less than -45dB will be inaudible due to the effect of noise, making high-fidelity reproduction impossible.

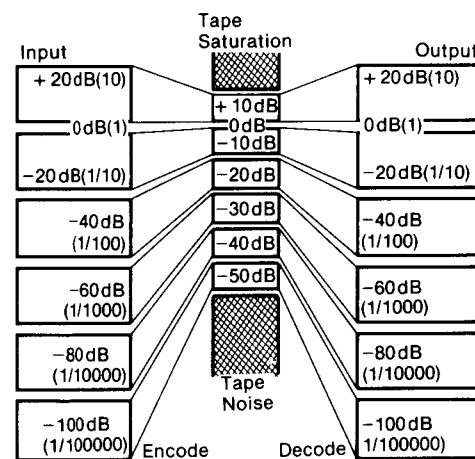
The dbx system, however, linearly compresses the input level by a ratio of 1/2 in decibels prior to recording it onto the tape. A +20dB sound is thus compressed to +10dB, a -20dB sound is compressed to -10dB, and a -90dB sound is compressed to -45dB.

As a result, a signal with a dynamic range extending from -90dB to +20dB (a 110dB dynamic range) can be contained within a range which extends from -45dB to +10dB (a 55dB dynamic range). Recording onto a cassette tape with a 55dB dynamic range is then possible.

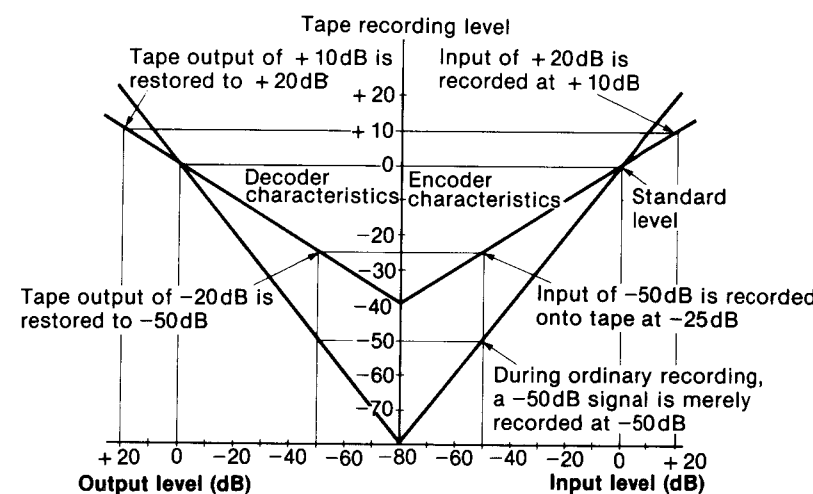
Prior to playback, the exact opposite process occurs and the sound levels are expanded. The +10dB sound is restored to its original level of +20dB, the -10dB sound is restored to -20dB, and the -45dB sound is restored to -90dB.

Therefore, the basic principle of the dbx system, as described above, is to compress the 110dB dynamic range by 1/2 to 55dB prior to recording, and then the expand it (by 2x) prior to playback.

dbx system function diagram



Level compression/expansion diagram



## ENCODER

- The portion of the dbx system which compresses the volume level of the input signal by 1/2 (measured in decibels), before sending it to the recording system, is called the encoder.

### ① INPUT BANDPASS FILTER (27Hz—20kHz)

To prevent pulse noise or other types of interference from causing erroneous operation of the dbx system, all signals outside the 27Hz—20kHz audio band range are eliminated here.

### ② PRE-EMPHASIS

The high frequency range, where hiss noise is prominent, is emphasized here during recording. The end result is that, although the dbx system is effective in reducing noise across entire frequency band, noise in the high frequency range is reduced still more by this pre-emphasis circuitry.

### ③ VCA (voltage-controlled amplifier/attenuator)

This is an extremely important circuitry in the construction of the dbx system. In response to the incoming DC control voltage, the VCA varies the degree of amplification logarithmically in the same manner as the direct current, resulting in compression and expansion of the input signal's dynamic range.

### ④ RMS DETECTOR (RMS: root mean square)

This is an important element in the composition of the dbx system, because its circuitry generates a DC voltage (the voltage that controls the degree of amplification in the VCA) in proportion to the size of the input signal.

It does this by detecting the root mean square value of the input signal, and then converting it to a DC voltage in proportion to the logarithm of the detected level. Erroneous operation due to phase shift is prevented by monitoring of the voltage level derived from the root mean square value.

### ⑤ WEIGHTING

To prevent the saturation level of the tape deck in high frequencies, this increases the RMS DETECTOR high frequency sensitivity and decreases the VCA high frequency gain. As a result, the linearity of the tape deck is enhanced in the high frequency range.

### ⑥ RMS FILTER (27Hz to 10kHz)

This filter cuts any signal other than 27Hz to 10kHz that mixes in input signals to prevent the RMS DETECTOR from malfunctioning. Those to be cut include an FM tuner STEREO PILOT signal, tape deck bias leakage and record player motor rotational noise. In addition, the signal in the frequency range (27Hz to 10kHz) passing through the BAND PASS FILTER is comparatively small in level variations when handled by the tape deck.

This ensures correct complementarity in the operation of the RMS DETECTOR and VCA during Encoding and Decoding.

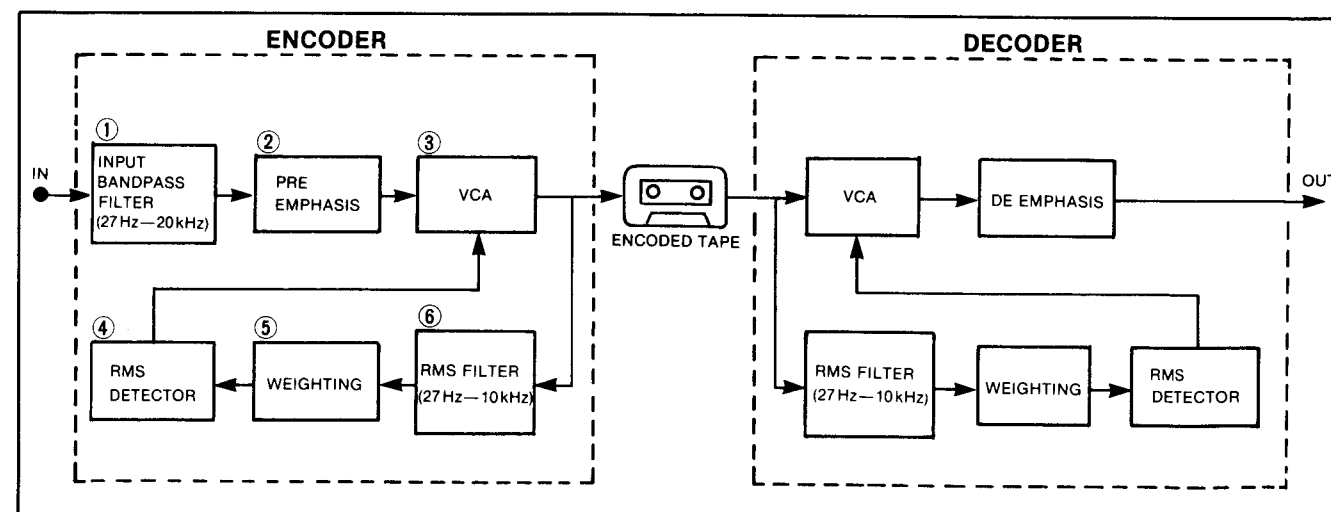
## DECODER

As shown in the diagram on the previous page, for playback output, the decoder expands the constantly changing level to double the decibel range.

For example, a -30dB signal is expanded to -60dB, and a level of -45dB becomes -90dB. On the other hand, a playback output +10dB is expanded to +20dB, and a saturation level signal is also correspondingly increased.

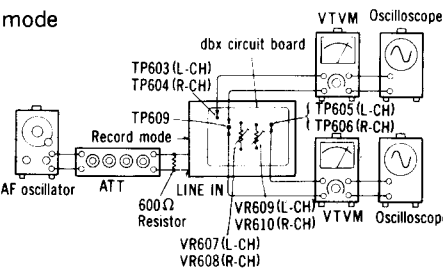
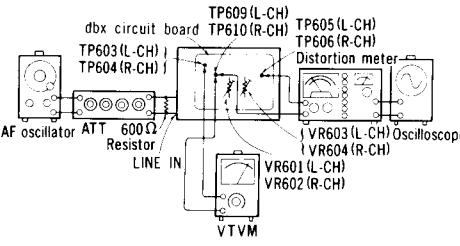
In terms of the system's operation, the decoder's function is the exact opposite of the function of the previously mentioned encoder.

## THE BLOCK DIAGRAM OF dbx SYSTEM



(Block configuration change for dbx circuit Encode/Decode is electrically performed by switching transistors between blocks.)



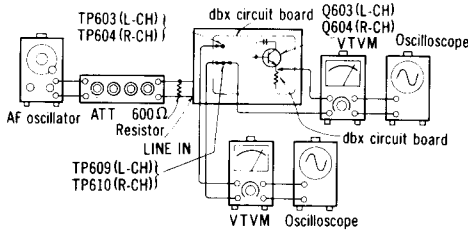
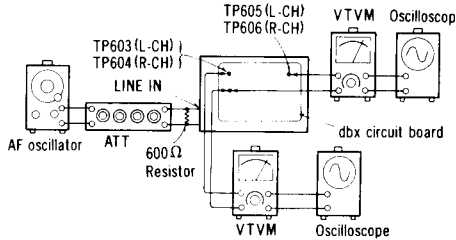
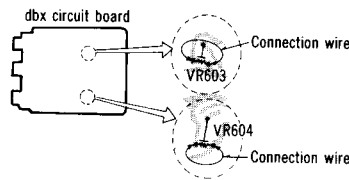
ITEM	ADJUSTMENT
<p>Condition:</p> <ul style="list-style-type: none"><li>• Record/stop mode</li><li>• Input level controls ... MAX</li><li>• Noise reduction selector ... disc/dbx tape</li></ul> <p>Equipment:</p> <ul style="list-style-type: none"><li>• VTVM</li><li>• AF oscillator</li><li>• ATT</li><li>• Oscilloscope</li><li>• Resistor (600Ω)</li></ul>	<p><b>②-1 Standard level adjustment in dbx Encode mode</b></p> <ol style="list-style-type: none"><li>1. Make the connection as shown in fig. 12 and apply 1kHz -27dB signal from LINE IN, and set the noise reduction selector to dbx tape position.</li><li>2. Set unit to record mode, adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) is 300mV.</li><li>3. Adjust VR607 (L-CH) and VR608 (R-CH) so that the output signal level at TP605 (L-CH) and TP606 (R-CH) becomes 300mV ± 0.5dB.</li></ol> <p><b>Fig. 12</b></p>  <p><b>②-2 Standard level adjustment in dbx Decode mode</b></p> <ol style="list-style-type: none"><li>1. Make the connection as shown in fig. 12 and apply 1kHz -27dB signal from LINE IN, and perform the following adjustments.</li><li>2. Set the noise reduction selector to disc position, and adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) becomes 300mV.</li><li>3. Adjust VR609 (L-CH) and VR610 (R-CH) so that the output signal level at TP605 (L-CH) and TP606 (R-CH) becomes 300mV ± 0.5dB.</li></ol> <p><b>③ Adjustment of output signal distortion factor</b></p> <p>Condition:</p> <ul style="list-style-type: none"><li>• Stop mode</li><li>• Input level controls ... MAX</li><li>• Noise reduction selector ... disc</li></ul> <p>Equipment:</p> <ul style="list-style-type: none"><li>• VTVM</li><li>• AF oscilloscope</li><li>• ATT</li><li>• Oscilloscope</li><li>• Resistor (600Ω)</li><li>• Distortion meter</li></ul> <ol style="list-style-type: none"><li>1. Make the connection as shown in fig. 13 and apply 1kHz -27dB signal from LINE IN, and perform the following adjustments.</li><li>2. Set the noise reduction selector to disc position, and adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) becomes 300mV - 3dB.</li><li>3. Adjust VR601 (L-CH) and VR602 (R-CH) so that output signal distortion at TP605 (L-CH) and TP606 (R-CH) is minimized.</li><li>4. Adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) becomes 300mV + 2dB.</li><li>5. Adjust VR603 (L-CH) and VR604 (R-CH) so that output signal distortion at TP605 (L-CH) and TP606 (R-CH) is minimized.</li><li>6. Repeat adjustments 2 through 5 until the distortion factor is minimized.</li></ol> <p><b>Fig. 13</b></p>  <p><b>NOTE:</b> After adjustments ①, ② and ③, re-check according to "dbx SYSTEM CHECKING METHOD". If the specifications are not satisfied, perform the adjustments again.</p>

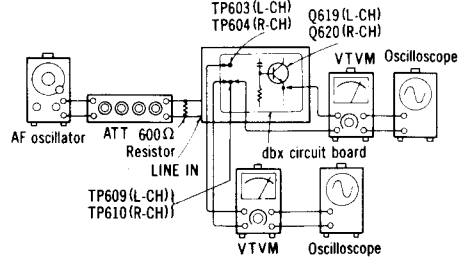
• CHECKING PROCEDURE FOR PROBLEMS

**NOTES:** Find defective parts according to the circuit operation checking method given below, and use the results for your reference during repair. Remember to adjust after repair.  
Keep good condition, set switches and controls in the following positions, unless otherwise specified.

- Input selector: Line in
- Input level controls: Maximum

ITEM	CHECKING METHOD
<p><b>① Operation check of regulated power supply circuit in dbx circuit</b></p> <p>Equipment:</p> <ul style="list-style-type: none"><li>• DC volt meter</li><li>• Oscilloscope</li></ul>	<p><b>①-1 Check of 19V voltage</b></p> <p>Make the connection as shown in fig. 14 and make sure that the emitter voltage of Q645 (TP611) is around 19V.</p> <p><b>①-2 Check of 9.5V voltage</b></p> <p>Make the connection as shown in fig. 14 and make sure that the emitter voltage of Q647 is around 9.5V.</p> <p><b>Fig. 14</b></p>

ITEM	CHECKING METHOD																																																																																																																						
<div>2</div> <div>Check of control circuit in dbx circuit</div> <div>Equipment:<ul style="list-style-type: none"><li>• DC volt meter</li></ul></div>	<div>E.C.B (G.S.D) voltage check of each switching transistor for Encode/Decode</div> <div>The terminal voltage of each switching transistor in Encode/Decode mode are shown in the table below.</div> <table><tr><th rowspan="2">Transistor Ref. No.</th><th colspan="3">Encode</th><th colspan="3">Decode</th></tr><tr><th>E (G)</th><th>C (S)</th><th>B (D)</th><th>E (G)</th><th>C (S)</th><th>B (D)</th></tr><tr><td>Q601, 602</td><td>0V</td><td>9.4V</td><td>9.4V</td><td>0V</td><td>9.4V</td><td>9.4V</td></tr><tr><td>Q605</td><td>10.3V</td><td>9.5V</td><td>0V</td><td>10.3V</td><td>10.2V</td><td>10.8V</td></tr><tr><td>Q606</td><td>10.4V</td><td>9.5V</td><td>0V</td><td>10.4V</td><td>10.4V</td><td>11.0V</td></tr><tr><td>Q607</td><td>10.3V</td><td>10.3V</td><td>10.8V</td><td>0V</td><td>10.3V</td><td>0V</td></tr><tr><td>Q608</td><td>10.4V</td><td>10.4V</td><td>11.0V</td><td>0V</td><td>10.4V</td><td>0V</td></tr><tr><td>Q615</td><td>0V</td><td>9.5V</td><td>0V</td><td>9.5V</td><td>9.5V</td><td>10.0V</td></tr><tr><td>Q628</td><td>0V</td><td>9.4V</td><td>9.3V</td><td>0V</td><td>9.4V</td><td>9.3V</td></tr><tr><td>Q629, 630</td><td>0V</td><td>9.5V</td><td>9.5V</td><td>0V</td><td>9.5V</td><td>9.5V</td></tr><tr><td>Q631, 632</td><td>0V</td><td>9.4V</td><td>9.4V</td><td>0V</td><td>9.4V</td><td>9.4V</td></tr><tr><td>Q633</td><td>0V</td><td>9.1V</td><td>9.0V</td><td>0V</td><td>9.1V</td><td>9.0V</td></tr><tr><td>Q634</td><td>0V</td><td>9.1V</td><td>9.1V</td><td>0V</td><td>9.1V</td><td>9.1V</td></tr><tr><td>Q635, 636</td><td>0V</td><td>9.1V</td><td>9.1V</td><td>0V</td><td>9.1V</td><td>9.1V</td></tr><tr><td>Q637</td><td>0V</td><td>0.3V</td><td>0V</td><td>0V</td><td>0.6V</td><td>0V</td></tr><tr><td>Q638</td><td>0V</td><td>22.0V</td><td>0V</td><td>0V</td><td>22.0V</td><td>0V</td></tr><tr><td>Q640</td><td>0V</td><td>0V</td><td>0.7V</td><td>0V</td><td>17.4V</td><td>0V</td></tr></table>	Transistor Ref. No.	Encode			Decode			E (G)	C (S)	B (D)	E (G)	C (S)	B (D)	Q601, 602	0V	9.4V	9.4V	0V	9.4V	9.4V	Q605	10.3V	9.5V	0V	10.3V	10.2V	10.8V	Q606	10.4V	9.5V	0V	10.4V	10.4V	11.0V	Q607	10.3V	10.3V	10.8V	0V	10.3V	0V	Q608	10.4V	10.4V	11.0V	0V	10.4V	0V	Q615	0V	9.5V	0V	9.5V	9.5V	10.0V	Q628	0V	9.4V	9.3V	0V	9.4V	9.3V	Q629, 630	0V	9.5V	9.5V	0V	9.5V	9.5V	Q631, 632	0V	9.4V	9.4V	0V	9.4V	9.4V	Q633	0V	9.1V	9.0V	0V	9.1V	9.0V	Q634	0V	9.1V	9.1V	0V	9.1V	9.1V	Q635, 636	0V	9.1V	9.1V	0V	9.1V	9.1V	Q637	0V	0.3V	0V	0V	0.6V	0V	Q638	0V	22.0V	0V	0V	22.0V	0V	Q640	0V	0V	0.7V	0V	17.4V	0V
Transistor Ref. No.	Encode			Decode																																																																																																																			
	E (G)	C (S)	B (D)	E (G)	C (S)	B (D)																																																																																																																	
Q601, 602	0V	9.4V	9.4V	0V	9.4V	9.4V																																																																																																																	
Q605	10.3V	9.5V	0V	10.3V	10.2V	10.8V																																																																																																																	
Q606	10.4V	9.5V	0V	10.4V	10.4V	11.0V																																																																																																																	
Q607	10.3V	10.3V	10.8V	0V	10.3V	0V																																																																																																																	
Q608	10.4V	10.4V	11.0V	0V	10.4V	0V																																																																																																																	
Q615	0V	9.5V	0V	9.5V	9.5V	10.0V																																																																																																																	
Q628	0V	9.4V	9.3V	0V	9.4V	9.3V																																																																																																																	
Q629, 630	0V	9.5V	9.5V	0V	9.5V	9.5V																																																																																																																	
Q631, 632	0V	9.4V	9.4V	0V	9.4V	9.4V																																																																																																																	
Q633	0V	9.1V	9.0V	0V	9.1V	9.0V																																																																																																																	
Q634	0V	9.1V	9.1V	0V	9.1V	9.1V																																																																																																																	
Q635, 636	0V	9.1V	9.1V	0V	9.1V	9.1V																																																																																																																	
Q637	0V	0.3V	0V	0V	0.6V	0V																																																																																																																	
Q638	0V	22.0V	0V	0V	22.0V	0V																																																																																																																	
Q640	0V	0V	0.7V	0V	17.4V	0V																																																																																																																	
<div>NOTE:</div> <div>If no abnormality is found in steps 1 and 2, check the operation for each part as follows:</div>																																																																																																																							
<div>3</div> <div>Operation check of INPUT BAND PASS FILTER circuit (27 Hz—20 kHz)</div> <div>Condition:<ul style="list-style-type: none"><li>• Record mode</li><li>• Input level controls ... MAX</li><li>• Noise reduction selector ... dbx tape</li></ul></div> <div>Equipment:<ul style="list-style-type: none"><li>• VTVM</li><li>• AF oscillator</li><li>• ATT</li><li>• Oscilloscope</li><li>• Resistor (600Ω)</li></ul></div>	<div><div><div><div>1. Make the connections as shown in fig 15, and apply 100Hz —27 dB signal from LINE IN, and set the noise reduction selector to dbx tape position.</div><div>2. Set the unit to record mode.</div><div>3. Adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) is 300 mV.</div><div>4. Make sure that the emitter signal level of Q603 (L-CH) and Q604 (R-CH) is 300 mV.</div><div>5. Set the input signal frequency to 5 kHz and make sure that the emitter signal of Q603 (L-CH) and Q604 (R-CH) remains at the same level (300 mV).</div></div><div></div><div>Fig. 15</div></div></div>																																																																																																																						
<div>4</div> <div>Operation check of VCA circuit and Pre-emphasis/De-emphasis circuit</div> <div>Condition:<ul style="list-style-type: none"><li>• Stop/record mode</li><li>• Input level controls ... MAX</li><li>• Noise reduction selector ... disc/dbx tape</li></ul></div> <div>Equipment:<ul style="list-style-type: none"><li>• VTVM</li><li>• AF oscillator</li><li>• ATT</li><li>• Oscilloscope</li><li>• Resistor (600Ω)</li></ul></div>	<div><div><div><div>4-1 Operation check of VCA circuit and Pre-emphasis circuit</div><div><div><div>1. Make the connections as shown in fig. 16, and apply 100Hz —27 dB signal from LINE IN.</div><div>2. Short-circuit both terminals of VR603 (L-CH) and VR604 (R-CH) as shown in fig. 17 to make the VCA control voltage 1/2 Vcc (9.5 V), so that the gain of VCA does not change.</div><div>3. Set the unit to record mode, and set the noise reduction selector to dbx tape position.</div><div>4. Adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) is 300 mV.</div><div>5. Make sure that the output signals at TP605 (L-CH) and TP606 (R-CH) are sinusoidal. (The operation of VCA can then be checked.)</div></div><div></div><div>Fig. 16</div><div></div><div>Fig. 17</div></div></div></div></div>																																																																																																																						

ITEM	CHECKING METHOD
	<ol style="list-style-type: none"><li>6. Shift the frequency of input signal to 5kHz, and make sure that the output signal levels at TP605 (L-CH) and TP606 (R-CH) are increased by about 12 dB. (The operation of the Pre-emphasis circuit can then be checked.)</li></ol> <b>4-2 Operation check of VCA circuit and De-emphasis circuit</b> <ol style="list-style-type: none"><li>1. The procedure is the same as 1—2 for the above VCA circuit and Pre-emphasis circuit.</li><li>2. Set the noise reduction selector to disc position.</li><li>3. Adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) is 300 mV.</li><li>4. Make sure that the output signals at TP605 (L-CH) and TP606 (R-CH) are sinusoidal. (The operation of VCA can then be checked.)</li><li>5. Change the frequency of input signal to 5kHz and make sure that the output signal level at TP605 (L-CH) and TP606 (R-CH) is decreased by about 12 dB. (The operation of the De-emphasis circuit can then be checked.)</li></ol> <b>NOTE:</b> After check, disconnect the short-circuited terminals of VR603 (L-CH) and VR604 (R-CH).
<b>5 Operation check of RMS FILTER circuit (27 Hz—10 kHz)</b> Condition: • Stop mode • Input level controls ... MAX • Noise reduction selector ... disc Equipment: • VTVM      • AF oscillator • ATT        • Oscilloscope • Resistor (600Ω)	<ol style="list-style-type: none"><li>1. Make the connections as shown in fig. 18, and apply 100Hz —27 dB signal from LINE IN.</li><li>2. Set the noise reduction selector to disc position.</li><li>3. Adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) is 300 mV.</li><li>4. Make sure that the emitter signal level of Q619 (L-CH) and Q620 (R-CH) is around 300 mV.</li><li>5. Change the frequency of input signal to 5kHz and make sure that the emitter signal of Q619 (L-CH) and Q620 (R-CH) remains at the same level (300 mV).</li></ol>  <p style="text-align: center;"><b>Fig. 18</b></p>

# • ADJUSTMENT PARTS LOCATION OF dbx SYSTEM

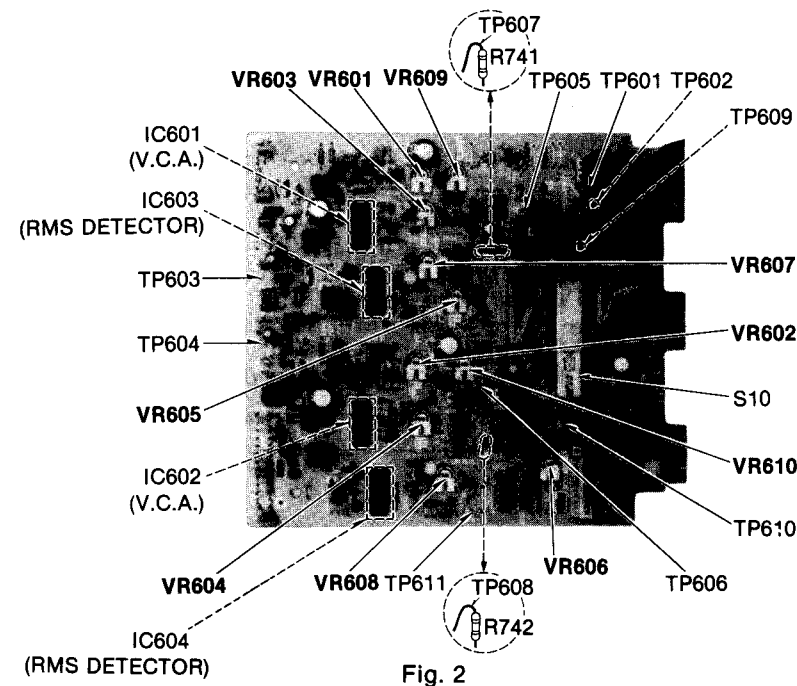


Fig. 2

## • SIGNAL WAVE FORMS AT INDIVIDUAL SECTIONS OF THE RMS DETECTOR CIRCUIT & VCA CIRCUIT (FOR OPERATION CHECK OF dbx SYSTEM)

Figures 4 and 5 show the signal waveforms at pins of the major ICs when an input signal (1kHz, 300mV) shown in Fig. 3 is applied to the input terminals TP603 (L-CH) and TP604 (R-CH) of the dbx system.

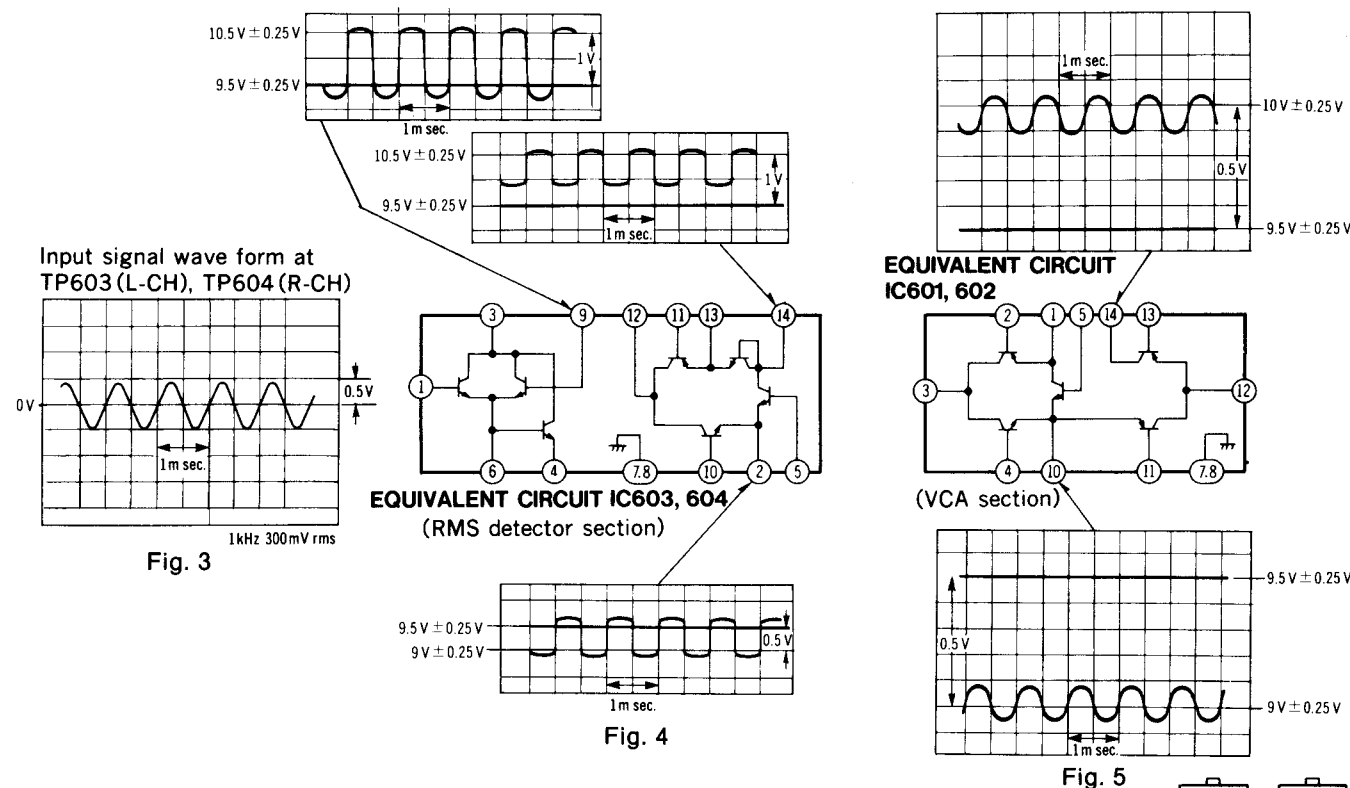


Fig. 3

Fig. 4

Fig. 5

### Measurement Method and condition

1. Make the connections as shown in fig. 6, and apply 1kHz -27dB signal from LINE IN, and set the noise reduction selector to dbx tape position.
2. Set the unit to record mode, adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) is 300mV.

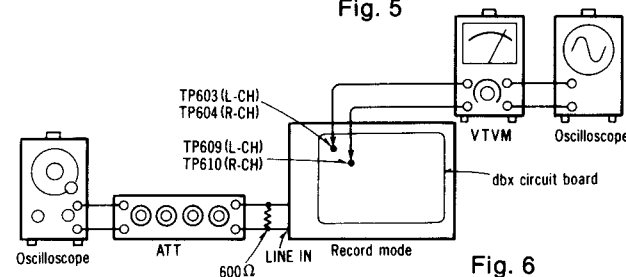


Fig. 6

## • dbx SYSTEM CHECKING METHOD

NOTES: Keep good condition, set switches and controls in the following positions, unless otherwise specified.

• Input selector: Line in

• Input level controls: Maximum

ITEM	CHECKING METHOD
<b>A Check for expansion/compression</b> Condition: • Stop/record mode • Input level controls ... MAX • Noise reduction selector ... disc/dbx tape Equipment: • VTVM • AF oscillator • ATT • Oscilloscope • Resistor (600Ω)	<b>A-1 Check for expansion</b> 1. Make the connections as shown in fig. 7 and apply 1kHz -27dB signal from LINE IN, and set the noise reduction selector to disc position. 2. Adjust ATT, increase input signal level by 10dB, and make sure that the reading for VTVM increases by 20dB ± 1dB. 3. Adjust ATT, decrease the input signal level, and make sure that the reading for VTVM decreases by 20dB ± 1dB. <b>A-2 Check for compression</b> 1. Make the connections as shown in fig. 8 and apply 1kHz -27dB signal from LINE IN, and set the noise reduction selector to dbx tape position. 2. Set the unit to record mode. 3. Adjust ATT, increase input signal level by 10dB, and make sure that the reading for VTVM at TP605 (L-CH) and TP606 (R-CH) increases by 5 ± 1dB. 4. Adjust ATT, decrease the input signal level, and make sure that the reading for VTVM at TP605 (L-CH) and TP606 (R-CH) decreases by 5 ± 1dB.
<b>B Check for standard level of dbx</b> Condition: • Stop/record mode • Input level controls ... MAX • Noise reduction selector ... disc/dbx tape Equipment: • VTVM • AF oscillator • ATT • Oscilloscope • Resistor (600Ω)	<b>B-1 Check for standard level of dbx in dbx Encode mode</b> 1. Make the connections as shown in fig. 8 and apply 1kHz -27dB signal from LINE IN, and set the noise reduction selector to dbx tape position. 2. Set the unit to record mode, adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) is 300mV. 3. Make sure that the signal level at TP605 (L-CH) and TP606 (R-CH) is 300mV ± 0.5dB. <b>B-2 Check for standard level of dbx in dbx Decode mode</b> 1. Make the connections as shown in fig. 8 and apply 1kHz -27dB signal from LINE IN, and check as follows: 2. Set the noise reduction selector to disc position and adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) becomes 300mV. 3. Make sure that the signal level at TP605 (L-CH) and TP606 (R-CH) is 300mV ± 0.5dB.
<b>C Check for output signal distortion factor (Check for distortion factor of VCA)</b> Condition: • Stop/record mode • Input level controls ... MAX • Noise reduction selector ... disc/dbx tape Equipment: • VTVM • AF oscillator • ATT • Oscilloscope • Resistor (600Ω) • Distortion meter	<b>C-1 Check for output signal distortion factor in dbx Decode mode</b> 1. Make the connections as shown in fig. 9 and apply 1kHz -27dB signal from LINE IN, and check as follows: 2. Set the noise reduction selector to disc position, and adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) becomes 300mV. 3. Measure the distortion factor of output signal at TP605 (L-CH) and TP606 (R-CH), and make sure that the distortion factor is less than 0.2%. 4. Next, adjust ATT to raise the output signal level by 10dB and measure the distortion of output factor at TP605 (L-CH) and TP606 (R-CH). Make sure that the distortion is less than 0.8%. 5. Adjust ATT to set the output signal at a level 10dB lower than the dbx reference level (300mV), and measure the output signal distortion at TP605 (L-CH) and TP606 (R-CH) to check that it is less than 0.3%. <b>C-2 Check for output signal distortion factor in dbx Encode mode</b> 1. The connection is the same as above, as is the input signal. 2. Set the noise reduction selector to dbx tape position, and the unit to record mode. 3. Adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) is 300mV. 4. Measure the distortion factor of output signal at TP605 (L-CH) and TP606 (R-CH), and make sure that the distortion factor is less than 0.25%.

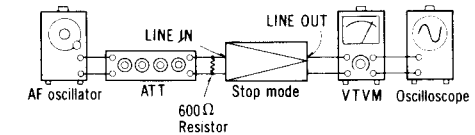


Fig. 7

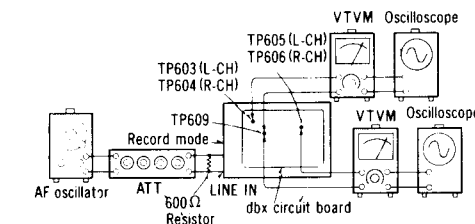


Fig. 8

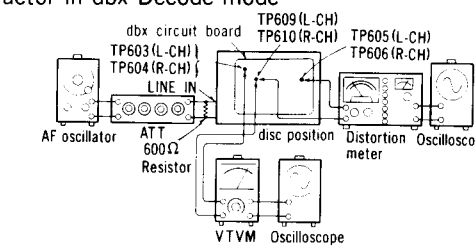


Fig. 9

### Check response circuit

Condition:  
 • Stop/record mode  
 • Input level controls ... MAX  
 • Noise reduction selector ... disc/dbx tape

Equipment:  
 • VTVM  
 • ATT  
 • Resistor

### ADJUSTMENT

NOTES: W

K

### Adjustment

Condition:  
 • Stop mode  
 • Input level controls ... MAX  
 • Noise reduction selector ... disc/dbx tape

Equipment:  
 • VTVM  
 • ATT  
 • Resistor

### Adjustment

standard

• dbx SYSTEM CHECKING METHOD

NOTES: Keep good condition, set switches and controls in the following positions, unless otherwise specified.

- Input selector: Line in
- Input level controls: Maximum

ITEM	CHECKING METHOD
<p><b>A Check for expansion/compression</b></p> <p>Condition:</p> <ul style="list-style-type: none"><li>• Stop/record mode</li><li>• Input level controls ... MAX</li><li>• Noise reduction selector ... disc/dbx tape</li></ul> <p>Equipment:</p> <ul style="list-style-type: none"><li>• VTVM</li><li>• AF oscillator</li><li>• ATT</li><li>• Oscilloscope</li><li>• Resistor (600Ω)</li></ul>	<p><b>A-1 Check for expansion</b></p> <ol style="list-style-type: none"><li>1. Make the connections as shown in fig. 7 and apply 1kHz -27 dB signal from LINE IN, and set the noise reduction selector to disc position.</li><li>2. Adjust ATT, increase input signal level by 10dB, and make sure that the reading for VTVM increases by 20dB ± 1dB.</li><li>3. Adjust ATT, decrease the input signal level, and make sure that the reading for VTVM decreases by 20dB ± 1dB.</li></ol> <p><b>A-2 Check for compression</b></p> <ol style="list-style-type: none"><li>1. Make the connections as shown in fig. 8 and apply 1kHz -27 dB signal from LINE IN, and set the noise reduction selector to dbx tape position.</li><li>2. Set the unit to record mode.</li><li>3. Adjust ATT, increase input signal level by 10dB, and make sure that the reading for VTVM at TP605 (L-CH) and TP606 (R-CH) increases by 5 ± 1dB.</li><li>4. Adjust ATT, decrease the input signal level, and make sure that the reading for VTVM at TP605 (L-CH) and TP606 (R-CH) decreases by 5 ± 1dB.</li></ol>
<p><b>B Check for standard level of dbx</b></p> <p>Condition:</p> <ul style="list-style-type: none"><li>• Stop/record mode</li><li>• Input level controls ... MAX</li><li>• Noise reduction selector ... disc/dbx tape</li></ul> <p>Equipment:</p> <ul style="list-style-type: none"><li>• VTVM</li><li>• AF oscillator</li><li>• ATT</li><li>• Oscilloscope</li><li>• Resistor (600Ω)</li></ul>	<p><b>B-1 Check for standard level of dbx in dbx Encode mode</b></p> <ol style="list-style-type: none"><li>1. Make the connections as shown in fig. 8 and apply 1kHz -27 dB signal from LINE IN, and set the noise reduction selector to dbx tape position.</li><li>2. Set the unit to record mode, adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) is 300mV.</li><li>3. Make sure that the signal level at TP605 (L-CH) and TP606 (R-CH) is 300mV ± 0.5 dB.</li></ol> <p><b>B-2 Check for standard level of dbx in dbx Decode mode</b></p> <ol style="list-style-type: none"><li>1. Make the connections as shown in fig. 8 and apply 1kHz -27 dB signal from LINE IN, and check as follows:</li><li>2. Set the noise reduction selector to disc position and adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) becomes 300 mV.</li><li>3. Make sure that the signal level at TP605 (L-CH) and TP606 (R-CH) is 300mV ± 0.5 dB.</li></ol>
<p><b>C Check for output signal distortion factor (Check for distortion factor of VCA)</b></p> <p>Condition:</p> <ul style="list-style-type: none"><li>• Stop/record mode</li><li>• Input level controls ... MAX</li><li>• Noise reduction selector ... disc/dbx tape</li></ul> <p>Equipment:</p> <ul style="list-style-type: none"><li>• VTVM</li><li>• AF oscillator</li><li>• ATT</li><li>• Oscilloscope</li><li>• Resistor (600Ω)</li><li>• Distortion meter</li></ul>	<p><b>C-1 Check for output signal distortion factor in dbx Decode mode</b></p> <ol style="list-style-type: none"><li>1. Make the connections as shown in fig. 9 and apply 1kHz -27 dB signal from LINE IN, and check as follows:</li><li>2. Set the noise reduction selector to disc position, and adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) becomes 300mV.</li><li>3. Measure the distortion factor of output signal at TP605 (L-CH) and TP606 (R-CH), and make sure that the distortion factor is less than 0.2%.</li><li>4. Next, adjust ATT to raise the output signal level by 10 dB and measure the distortion of output factor at TP605 (L-CH) and TP606 (R-CH). Make sure that the distortion is less than 0.8%.</li><li>5. Adjust ATT to set the output signal at a level 10dB lower than the dbx reference level (300mV), and measure the output signal distortion at TP605 (L-CH) and TP606 (R-CH) to check that it is less than 0.3%.</li></ol> <p><b>C-2 Check for output signal distortion factor in dbx Encode mode</b></p> <ol style="list-style-type: none"><li>1. The connection is the same as above, as is the input signal.</li><li>2. Set the noise reduction selector to dbx tape position, and the unit to record mode.</li><li>3. Adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) is 300 mV.</li><li>4. Measure the distortion factor of output signal at TP605 (L-CH) and TP606 (R-CH), and make sure that the distortion factor is less than 0.25%.</li></ol>

UIT &

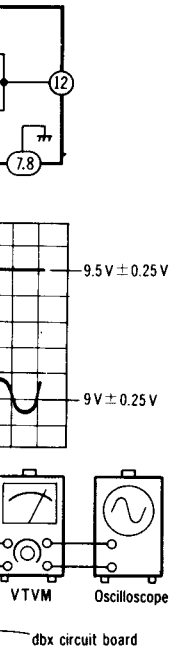
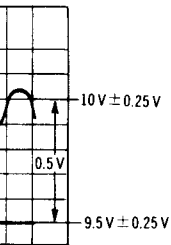


Fig. 6

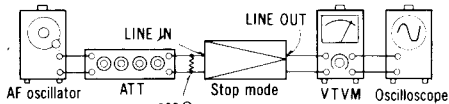


Fig. 7

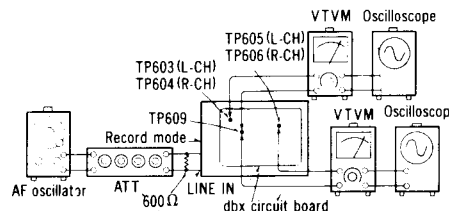


Fig. 8

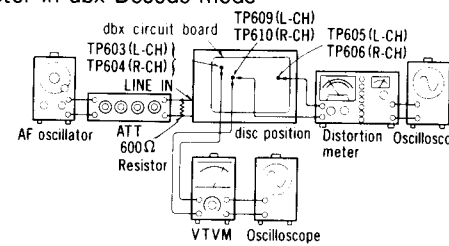


Fig. 9

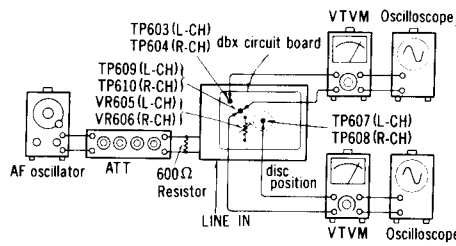


Fig. 10

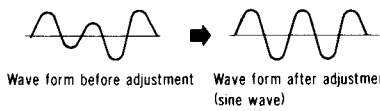


Fig. 11

ITEM	CHECKING METHOD																		
	<ol style="list-style-type: none"><li>5. Adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) becomes 300mV + 15 dB.</li><li>6. Make sure that the distortion factor of output signal is less than 0.8%. (Bias oscillation → STOP)</li></ol>																		
<p><b>D Check the frequency response of the dbx circuit</b></p> <p>Condition:</p> <ul style="list-style-type: none"><li>• Stop/record mode</li><li>• Input level controls ... MAX</li><li>• Noise reduction selector ... disc/dbx tape</li></ul> <p>Equipment:</p> <ul style="list-style-type: none"><li>• VTVM</li><li>• AF oscillator</li><li>• ATT</li><li>• Oscilloscope</li><li>• Resistor (600Ω)</li></ul>	<p><b>D-1 Check the frequency response during decoding</b></p> <ol style="list-style-type: none"><li>1. Make the connections as shown in fig. 8 and apply 1kHz -27 dB signal from LINE IN, and check as follows:</li><li>2. Set the noise reduction selector to disc position, and adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) becomes 300mV.</li><li>3. With the signal level at TP605 (L-CH) and TP606 (R-CH) as 0dB, change the signal frequency to 100Hz, 20Hz and 7kHz respectively. Read signal levels at TP605 (L-CH) and TP606 (R-CH) and check that they are within the specifications-1.</li></ol> <p><b>D-2 Check the frequency response during encoding</b></p> <ol style="list-style-type: none"><li>1. Make the connections as shown in fig. 8 and apply 1kHz -27 dB signal from LINE IN, and check as follows:</li><li>2. Set the noise reduction selector to dbx tape position, and the unit to record mode.</li><li>3. Adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) is 300mV.</li><li>4. With the signal level at TP605 (L-CH) and TP606 (R-CH) as 0dB, change the signal frequency to 100Hz and 7kHz respectively. Read signal levels at TP605 (L-CH) and TP606 (R-CH) and check that they are within the specifications-2.</li></ol>																		
	<p><b>Specifications-1</b></p> <table><tr><th>Frequency</th><th>Signal levels at TP605 and TP606</th></tr><tr><td>1kHz</td><td>0 dB (300mV)</td></tr><tr><td>100Hz</td><td>-0.5 dB ± 1dB</td></tr><tr><td>20Hz</td><td>-28 dB ± 5 dB</td></tr><tr><td>7 kHz</td><td>+ 7 dB ± 1dB</td></tr></table> <p><b>Specifications-2</b></p> <table><tr><th>Frequency</th><th>Signal levels at TP605 and TP606</th></tr><tr><td>1kHz</td><td>0 dB (300mV)</td></tr><tr><td>100Hz</td><td>+0.5 dB ± 1dB</td></tr><tr><td>7 kHz</td><td>-3.5 dB ± 1dB</td></tr></table>	Frequency	Signal levels at TP605 and TP606	1kHz	0 dB (300mV)	100Hz	-0.5 dB ± 1dB	20Hz	-28 dB ± 5 dB	7 kHz	+ 7 dB ± 1dB	Frequency	Signal levels at TP605 and TP606	1kHz	0 dB (300mV)	100Hz	+0.5 dB ± 1dB	7 kHz	-3.5 dB ± 1dB
Frequency	Signal levels at TP605 and TP606																		
1kHz	0 dB (300mV)																		
100Hz	-0.5 dB ± 1dB																		
20Hz	-28 dB ± 5 dB																		
7 kHz	+ 7 dB ± 1dB																		
Frequency	Signal levels at TP605 and TP606																		
1kHz	0 dB (300mV)																		
100Hz	+0.5 dB ± 1dB																		
7 kHz	-3.5 dB ± 1dB																		
	<p><b>NOTES:</b></p> <ul style="list-style-type: none"><li>• If the results of the above checks <b>A</b>, <b>B</b>, <b>C</b> and <b>D</b> do not satisfy the specifications, perform the following adjustments. If the specifications are not satisfied even after the adjustments, follow the checking procedure for problems.</li><li>• If the output signal is not produced or is extremely distorted, follow the checking procedure for problems.</li></ul>																		

• ADJUSTMENT OF dbx SYSTEM

NOTES: When adjusting the circuit of the dbx system, be sure to perform the adjustments in the following order:

- 1) Adjustment of RMS detector,
- 2) Adjustment of dbx standard level
- 3) Adjustment of output signal distortion factor.

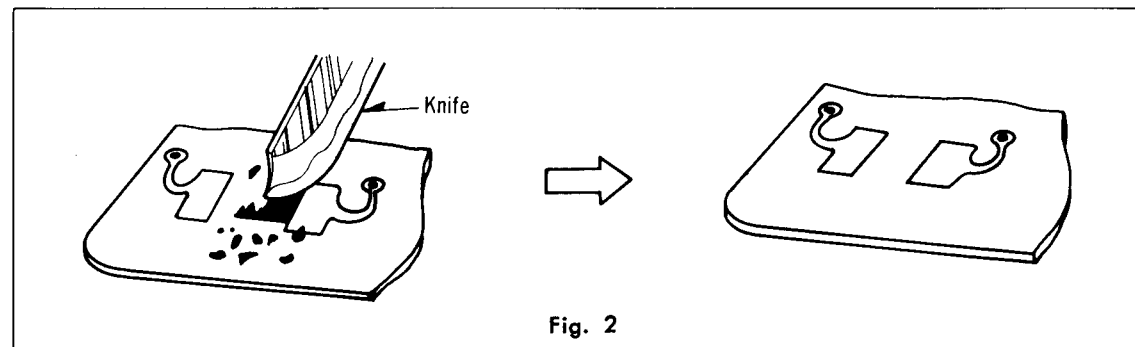
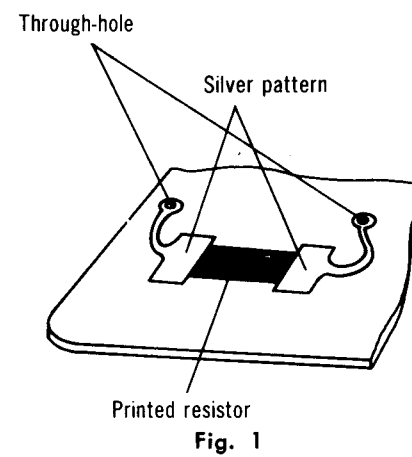
Keep good condition, set switches and controls in the following positions, unless otherwise specified.

- Input selector: Line in
- Input level controls: Maximum

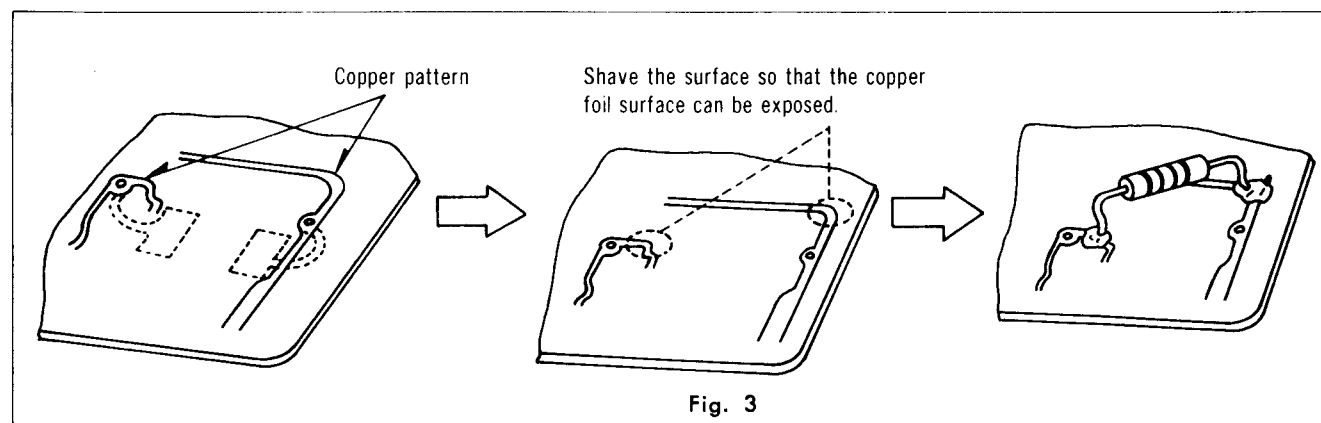
ITEM	ADJUSTMENT
<p><b>1 Adjustment of RMS detector</b></p> <p>Condition:</p> <ul style="list-style-type: none"><li>• Stop mode</li><li>• Input level controls ... MAX</li><li>• Noise reduction selector ... disc</li></ul> <p>Equipment:</p> <ul style="list-style-type: none"><li>• VTVM</li><li>• AF oscillator</li><li>• ATT</li><li>• Oscilloscope</li><li>• Resistor (600Ω)</li></ul>	<ol style="list-style-type: none"><li>1. Make the connections as shown in fig. 10, and set the noise reduction selector to disc position.</li><li>2. Apply 50 Hz -27 dB signal from LINE IN.</li><li>3. Adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) becomes 300mV.</li><li>4. Make sure that the output signal at TP607 (L-CH) and TP608 (R-CH) (Shown in fig. 2) is at 100Hz sine wave. If the output signal is not sinusoidal as shown in fig. 11, adjust VR605 (L-CH) and VR606 (R-CH) to make it sinusoidal.</li></ol> <p><b>NOTE:</b></p> <p>The voltage of the output signal after adjustment is about 0.8 to 1.1mVrms.</p>
<p><b>2 Adjustment of dbx standard level</b></p>	<p><b>NOTE:</b></p> <p>Be sure to perform the standard level adjustment in dbx Encode, followed by the standard level adjustment in dbx Decode.</p>

# HOW TO REPAIR PRINTED RESISTORS

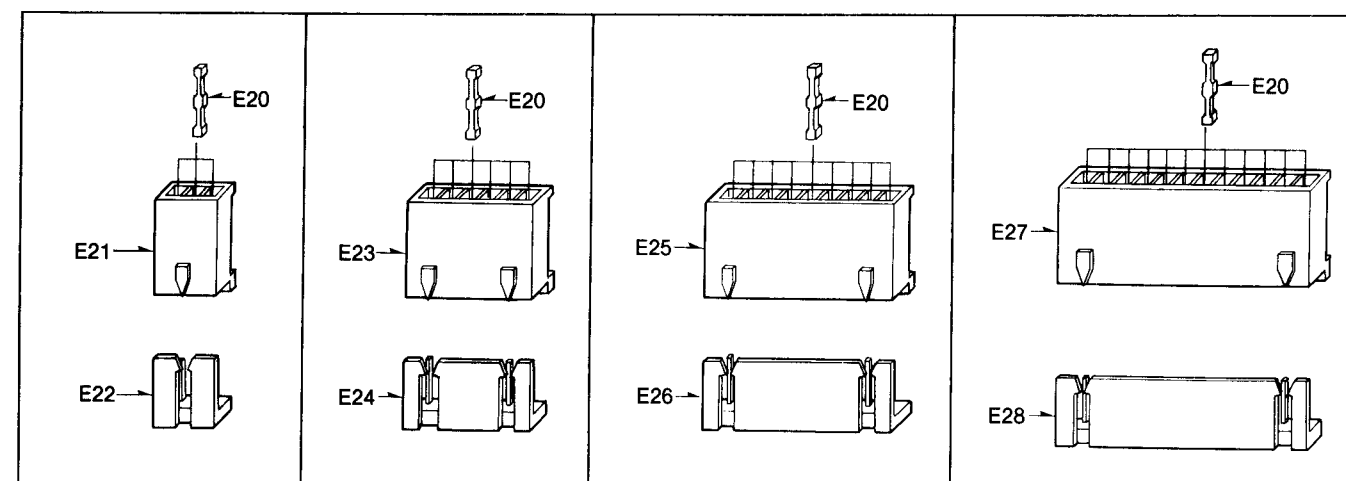
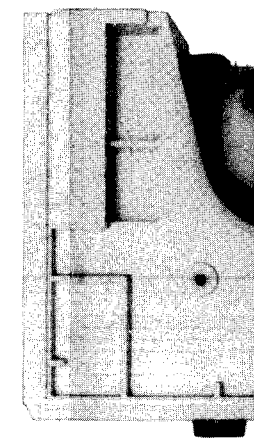
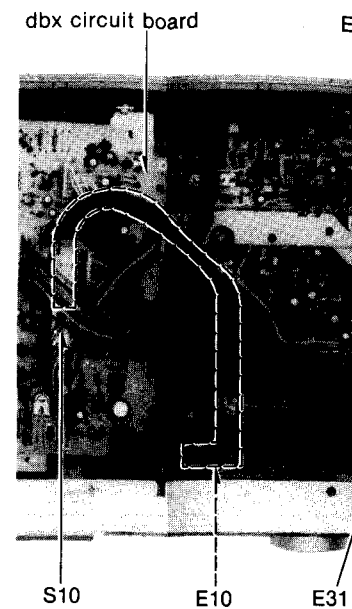
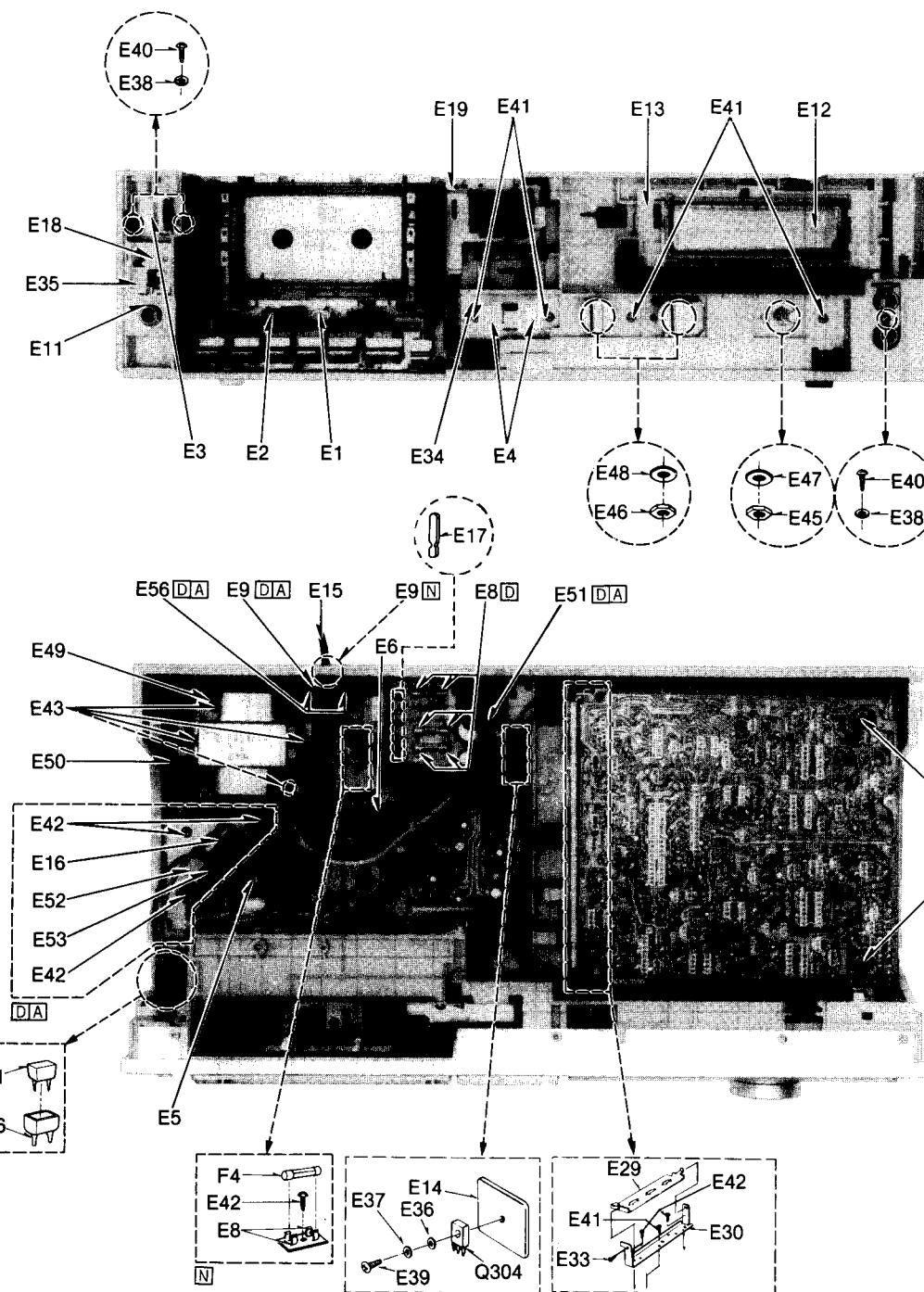
- The printed resistor is located on the printed circuit board as illustrated in Fig. 1.  
(The through-holes are the points that connect the silver pattern and the pattern on the rear of the printed circuit board.)
- Repair the printed resistor, when disconnected, in the following procedure:
  1. Using a pointed screwdriver or knife, completely scrape the printed resistor as illustrated in Fig. 2, and remove its shavings.



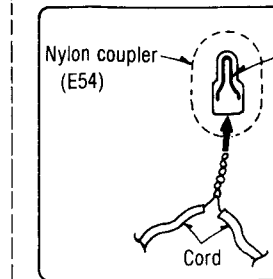
2. Turning the printed circuit board over as shown in Fig. 3, scrape the copper pattern surface near the through-holes until the copper foil surface can be exposed.
3. Solder the carbon resistor, whose resistance value is identical to the removed printed resistor, to the exposed copper foil surface.  
(Refer to the schematic diagram of the Service Manual for the resistance values of printed resistors.)



## ELECTRICAL PARTS LOCATION



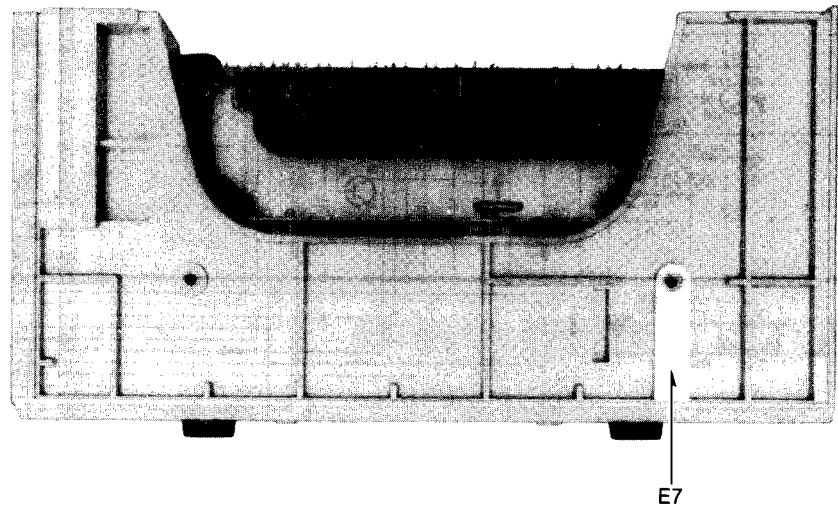
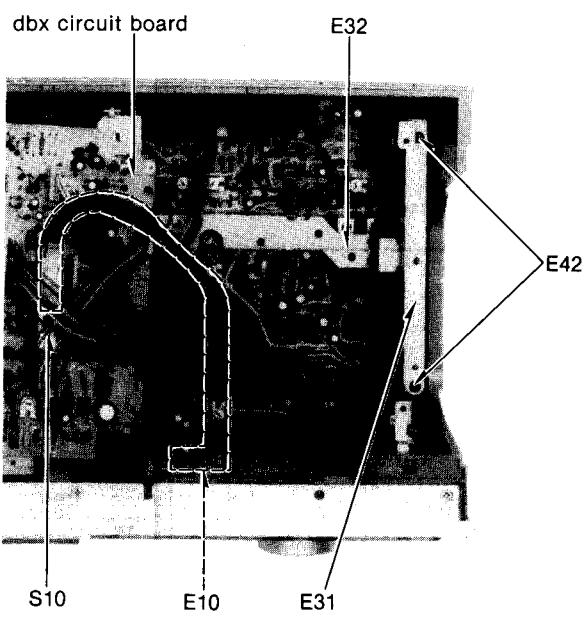
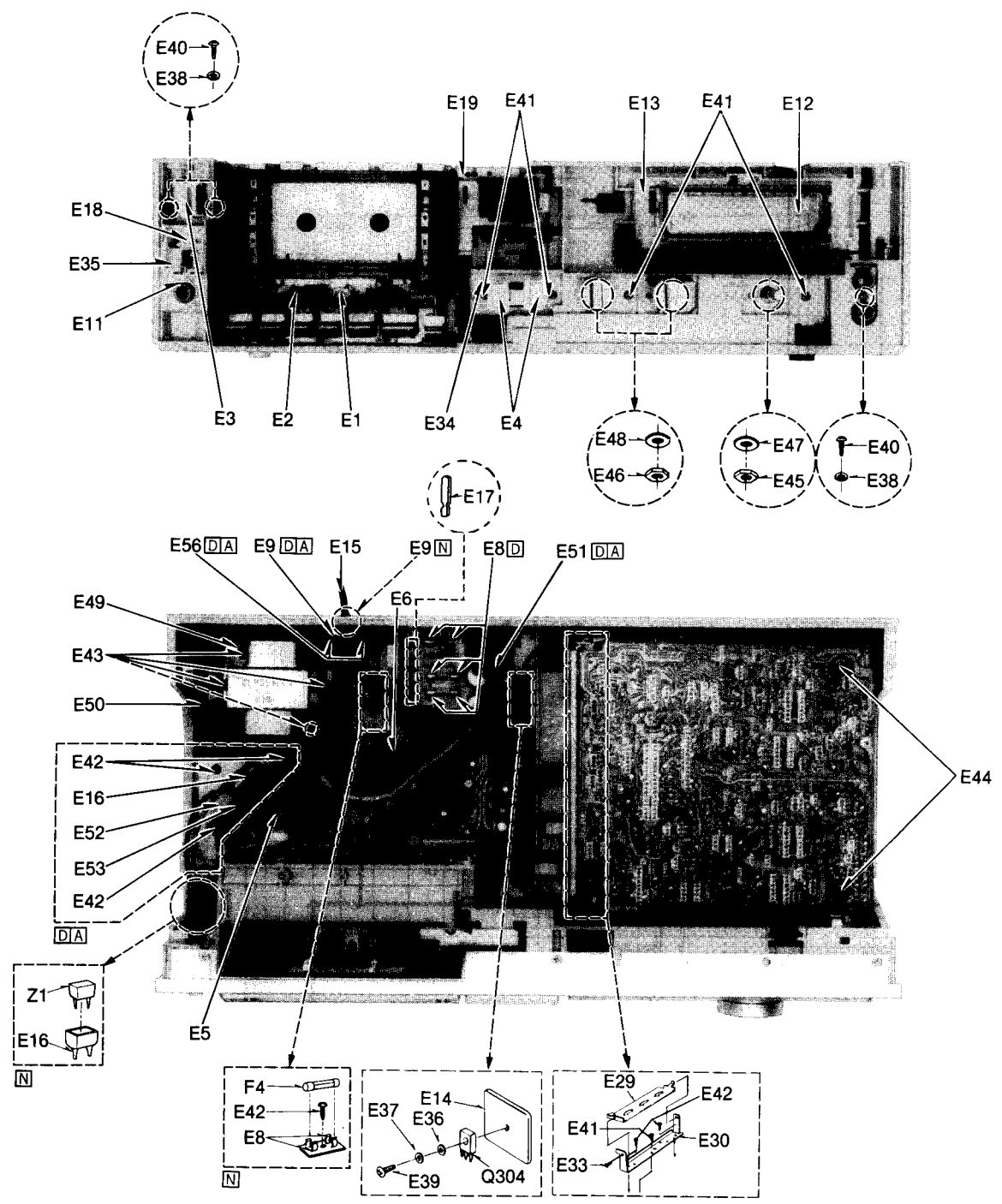
**Note:** Cord connection coupler (E54) req tool.



\* [N] ...



ELECTRICAL PARTS LOCATION



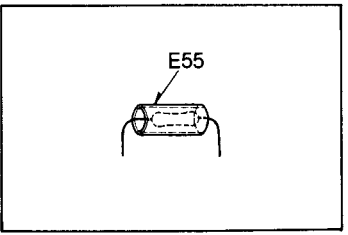
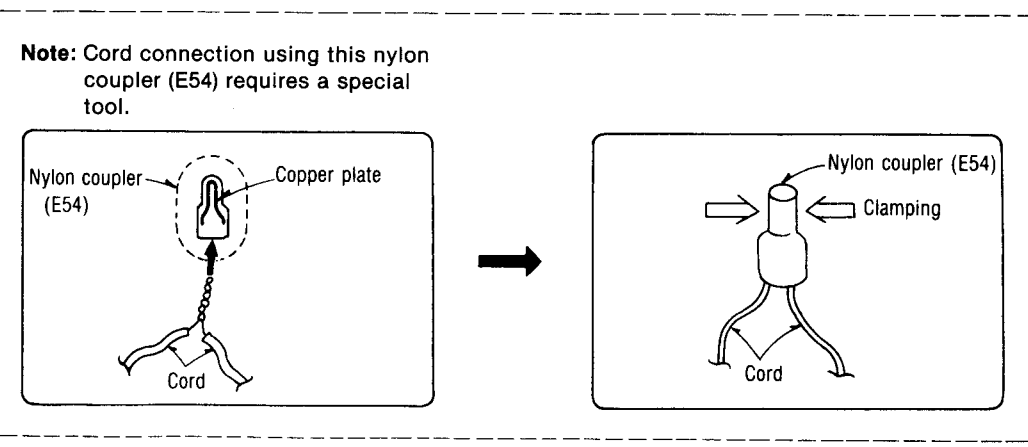
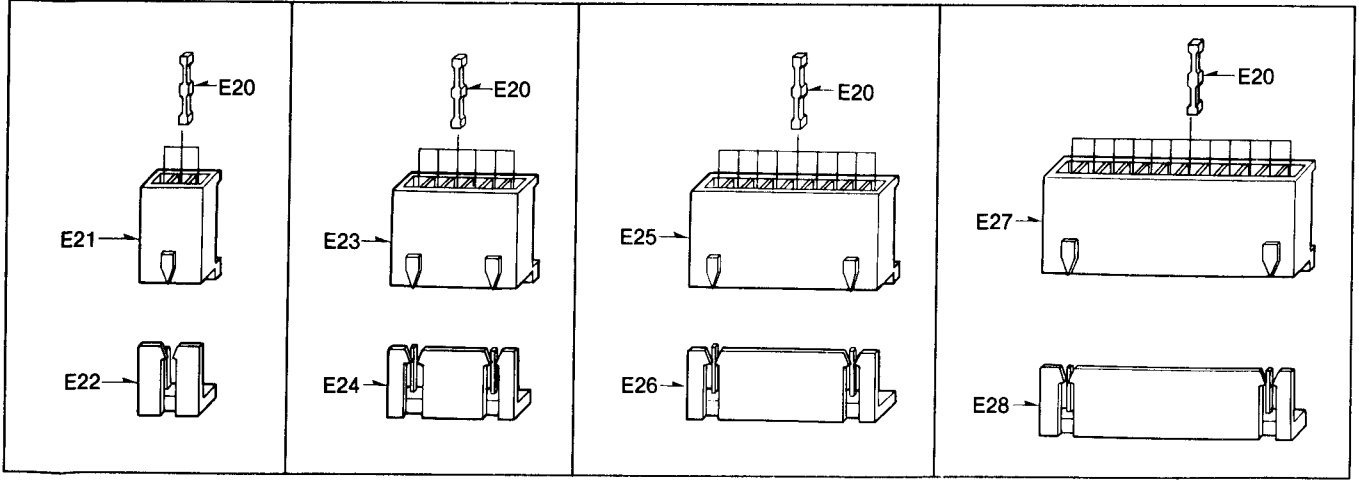
REPLACEMENT PARTS LIST

Important safety notice  
Components identified by  $\Delta$  mark have special characteristics important for safety.  
When replacing any of these components, use only manufacturer's specified parts.

Ref. No.	Part No.	Part Name & Description
<b>ELECTRICAL PARTS</b>		
E1	QWY4123Z	Record/Playback Head
E2	QWY2138Z	Erase Head
E3	QGO1872	Push Button (Power ON/OFF)
E4	QGO1799S	Push Button (Input Selector and REC MUTE)
E5	QML3664	Recording Lever
E6	QBS1130	Recording Wire
E7	QJC0034	Earth Plate
E8	QTF1054	Fuse Holder
* For all European areas.		
$\Delta$ QTF1049		
* For Asia, Latin America, Middle East and Africa areas.		
E9	QTD1164	Cord Clamp
* For all European areas and Australia.		
$\Delta$ QTD1129		
* For Asia, Latin America, Middle East and Africa areas.		
E10	ESA33227B	Cord Bushing
Rotary Selector (for Switching S10)		
E11	QNJ1070	Nut 12 $\phi$
E12	QSL5006RF	FL Meter
E13	QKJ0406	Meter Holder
E14	QTH1156	Heat Sink

- NOTES:
- $\Delta$  ...For all European areas.
  - $\Delta$  ...For Asia, Latin America, Middle East, and Africa areas.
  - $\Delta$  ...For Australia.

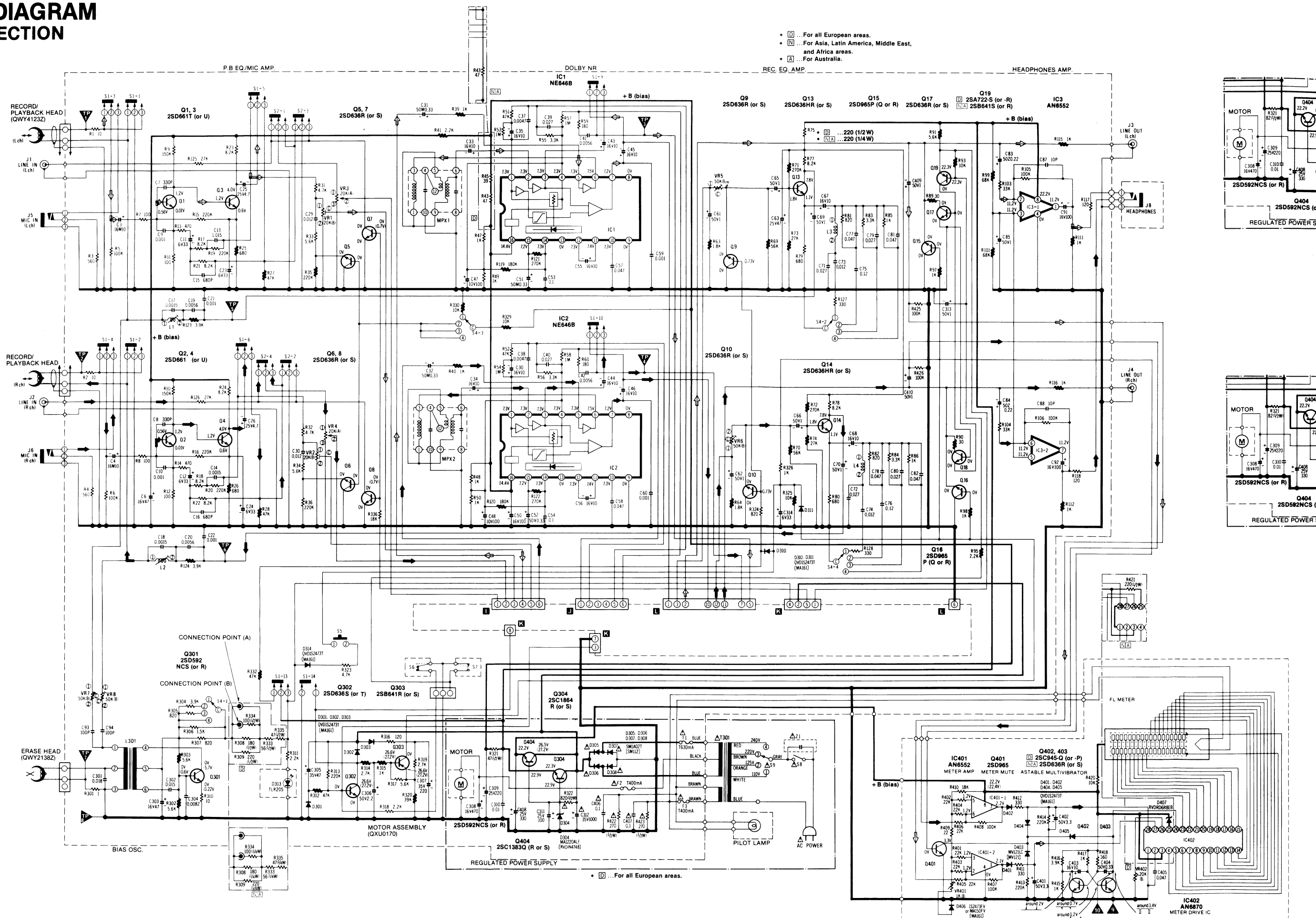
Ref. No.	Part No.	Part Name & Description	Ref. No.	Part No.	Part Name & Description
E15	$\Delta$ SJA88	AC Power Cord	E31	QMA4067	Circuit Board Angle-C
* For all European areas.					
$\Delta$ RJA522B-K					
* For Asia, Latin America, Middle East and Africa areas.					
$\Delta$ SJA623					
* For Australia.					
E16	$\Delta$ QTW1195	Spark Killer Cover	E32	QMA4068	Center Angle
* For all European areas and Australia.					
$\Delta$ QTW1118					
* For Asia, Latin America, Middle East and Africa areas.					
E17	QJT1067	Pin Terminal	E33	QHJ1177S	Step Screw
E18	XAMQ46P400	Pilot Lamp	E34	QMA3956	Volume Angle
E19	QJT0015	Lug Terminal	E35	QKJ0440	Pilot Lamp Cover
E20	QJT1054	Contact	E36	XWA26B	Washer 2.6 $\phi$
E21	QJS1921TN	3 Pin Socket	E37	XWG26	Washer 2.6 $\phi$
E22	QJP1921TN	3 Pin Post	E38	XWA3B	Washer 3 $\phi$
E23	QJS1922TN	6 Pin Socket	E39	XSN26+8	Screw $\phi$ 2.6 $\times$ 8
E24	QJP1922TN	6 Pin Post	E40	XSN3+8S	Screw $\phi$ 3 $\times$ 8
E25	QJS1923TN	9 Pin Socket	E41	XTN3+8B	Tapping Screw $\phi$ 3 $\times$ 8
E26	QJP1923TN	9 Pin Post	E42	XTN3+10B	Tapping Screw $\phi$ 3 $\times$ 10
E27	QJS1924TN	12 Pin Socket	E43	XTB4+10BFN	Screw $\phi$ 4 $\times$ 10
E28	QJP1924TN	12 Pin Post	E44	XTWQC3+8LFR	Screw $\phi$ 3 $\times$ 8
E29	QMA4065	Circuit Board Angle-A	E45	QNJ1039	Nut 9 $\phi$
E30	QMA4066	Circuit Board Angle-B	E46	QNJ1004	Nut 8 $\phi$
E31	QMA4067	Circuit Board Angle-C	E47	QWQ1133	Washer 9 $\phi$
E32	QMA4068	Center Angle	E48	QWQ2002	Washer 8 $\phi$
E33	QHJ1177S	Step Screw	E49	QMA4278	Transformer Angle
E34	QMA3956	Volume Angle	E50	QTS1553	Shield Plate
E35	QKJ0440	Pilot Lamp Cover	E51	$\Delta$ QTW00026	Switch Cover (for S9)
E36	XWA26B	Washer 2.6 $\phi$	* For all European areas and Australia.		
E37	XWG26	Washer 2.6 $\phi$	E52	$\Delta$ QMA4258	Terminal Plate Angle
E38	XWA3B	Washer 3 $\phi$	* For all European areas and Australia.		
E39	XSN26+8	Screw $\phi$ 2.6 $\times$ 8	E53	$\Delta$ QJT4017	4 Pin Terminal Plate
E40	XSN3+8S	Screw $\phi$ 3 $\times$ 8	* For all European areas and Australia.		
E41	XTN3+8B	Tapping Screw $\phi$ 3 $\times$ 8	E54	$\Delta$ QJT1029	Nylon Coupler
E42	XTN3+10B	Tapping Screw $\phi$ 3 $\times$ 10	* For Asia, Latin America, Middle East and Africa areas.		
E43	XTB4+10BFN	Screw $\phi$ 4 $\times$ 10	E55	$\Delta$ QZE0003	Porcelain Tube (for R782, 789, 790 and D621)
E44	XTWQC3+8LFR	Screw $\phi$ 3 $\times$ 8	* For all European areas.		
E45	QNJ1039	Nut 9 $\phi$	E56	$\Delta$ XTN3+16B	Tapping Screw $\phi$ 3 $\times$ 16
E46	QNJ1004	Nut 8 $\phi$	* For all European areas and Australia.		
E47	QWQ1133	Washer 9 $\phi$			
E48	QWQ2002	Washer 8 $\phi$			
E49	QMA4278	Transformer Angle			
E50	QTS1553	Shield Plate			



\*  $\Delta$  ...For Asia, Latin America, Middle East and Africa areas.

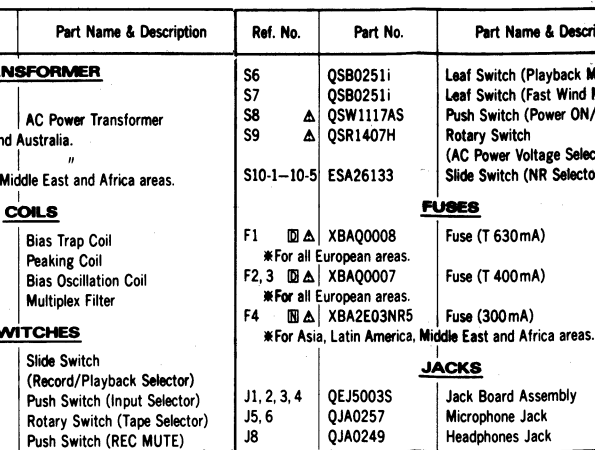
\*  $\Delta$  ...For all European areas.

## SCHEMATIC DIAGRAM MAIN AMP SECTION













ECQF ..... Polypropylene  
ECE□ ..... Electrolytic  
ECE□N ... Non polar electrolytic  
ECQS ..... Polystyrene  
ECS□ ..... Tantalum  
QCS ..... Tantalum


## CIRCUIT BOARDS

### MAIN AMP CIRCUIT BOARD

**NOTES:**

- The circuit shown in  on the conductor is + B (bias) circuit.
  - The circuit shown in  on the conductor indicates printed circuit, which is included printed type resistors.
  - The circuit shown in  on the conductor indicates printed circuit on the back side of the printed circuit board.
  - The symbols (\*) indicate connection points between conductors on the front side and back side of the circuit board.
  - Values indicated in  are under no signal condition and record mode with volume control at minimum position.
- However, the voltage in playback mode is indicated in (      ) when it differs from that in record mode.

- Described in the circuit board diagram are two types of numbers; the supply parts number and production parts number for transistors. One type of number is used for supply parts number and production parts number when they are identical.

e.g. Q1, 3  Supply parts number  
2SD661T

- The supply parts number is described alone in the replacement parts list.

- ☐ D ...For all European areas.
- ☐ N ...For Asia, Latin America, Middle East, and Africa areas.
- ☐ A ...For Australia.

[illegible]

Ref. No.	Part No.	Part Name & Description	Ref. No.	Part No.	Part Name & Description
<b><u>TRANSFORMER</u></b>					
T301			S6	QSB0251I	Leaf Switch (Playback Muting)
□□Δ	QLPD54ELC	AC Power Transformer	S7	QSB0251I	Leaf Switch (Fast Wind Muting)
*For all European areas and Australia.			S8	Δ QSW1117AS	Push Switch (Power ON/OFF)
□Δ	QLPN65ELC	"	S9	Δ QSR1407H	Rotary Switch
*For Asia, Latin America, Middle East and Africa areas.					(AC Power Voltage Selector)
			S10-1-10-5	ESA26133	Slide Switch (NR Selector)
<b><u>COILS</u></b>					
L1, 2	QLQC0331	Bias Trap Coil	<b><u>FUSES</u></b>		
L3, 4	QLQX0332K	Peaking Coil			
L301	QLBO198K	Bias Oscillation Coil			
MPX1, 2	QLM927	Multiplex Filter			
<b><u>SWITCHES</u></b>					
S1-1-1-14	QSSE203	Slide Switch (Record/Playback Selector)	F1	□Δ XBAQ0008	Fuse (T 630mA)
S2-1-2-4	QSWY203	Push Switch (Input Selector)	*For all European areas.		
S4-1-4-4	QSR4405	Rotary Switch (Tape Selector)	F2, 3	□Δ XBAQ0007	Fuse (T 400mA)
S5	QSWY203	Push Switch (REC MUTE)	*For all European areas.		
			F4	□Δ XBA2E03NR5	Fuse (300mA)
			*For Asia, Latin America, Middle East and Africa areas.		
<b><u>JACKS</u></b>					
J1, 2, 3, 4	QJ5003S	Jack Board Assembly			
J5, 6	QJA0257	Microphone Jack			
J8	QJA0249	Headphones Jack			

1	7.3V	9	0V
2	7.3V	10	7.3V
3	7.3V	11	7.4V
4	7.3V	12	7.3V
5	7.3V	13	0V
6	7.5V	14	7.3V
7	7.2V	15	7.2V
8	0V	16	14.4V

B	0V
C	26.6V (27.2V)
E	0V

1	11.2V
2	11.2V
3	11.2V
4	0V
5	11.2V
6	11.2V
7	11.2V
8	22.2V

B	0V (0.7V)
C	0V
E	0V

**Q19**  
☒ **D** 2SA722-S \_\_\_\_\_  
☒ **NA** 2SB641S (or R)

B	22.3V
C	0V
E	22.3V

B	22.9V
C	26.5V (27.2V)
E	22.2V

B	22.9V
C	29.7V
E	22.3V

**Q17, 18**  
**2SD636R (or S)**

B	0V
C	0V
E	0V

B	26.6 V (27.2 V)
C	0 V
E	26.6 V (27.2 V)

B	0.73V
C	0V
E	0V

Q15, 16  
2SD965P (Q on

B	0V
C	0V

**Q5, 6**  
**2SD636R (or S)**

B	0V
C	0V

Q3, 4  
2SD661T (or U)

**Q1, 2**  
**2SD661T (or U)**

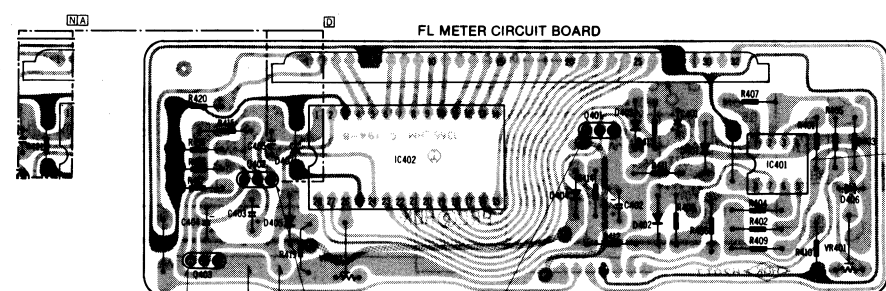
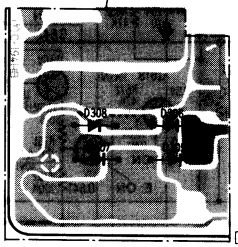
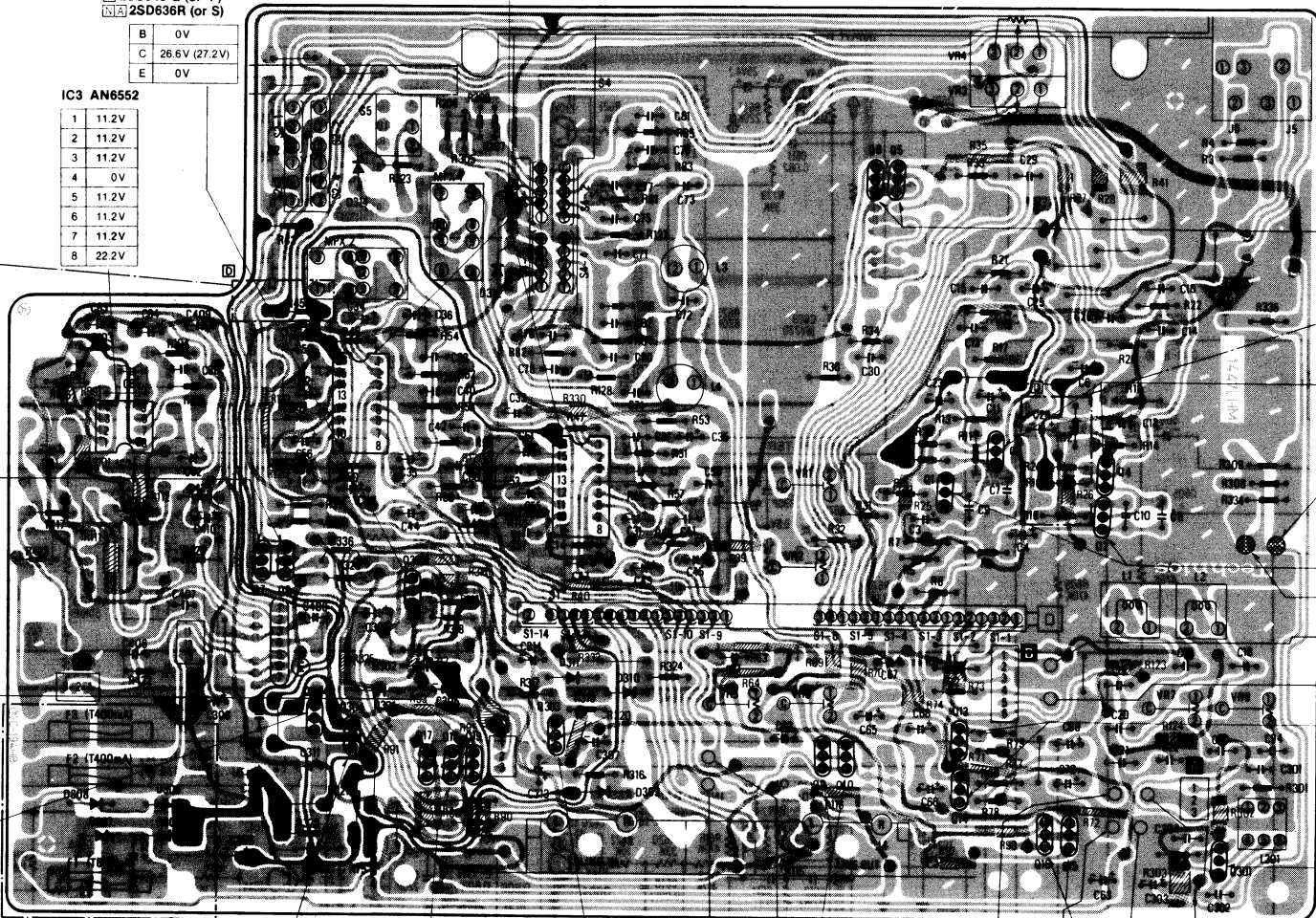
B	0.56V
C	1.2V

Q13, 14  
2SD636HR (or S)

B	1.8V
C	7.8V

**Q301**  
**2SD592NCS (or S**

B	(0.62 V)
C	(5.7 V)
E	(0.00 V)



IC401 AN6552			
1	2.1V	5	1.2V
2	1.2V	6	1.2V
3	1.2V	7	1.2V
4	0V	8	22.7V

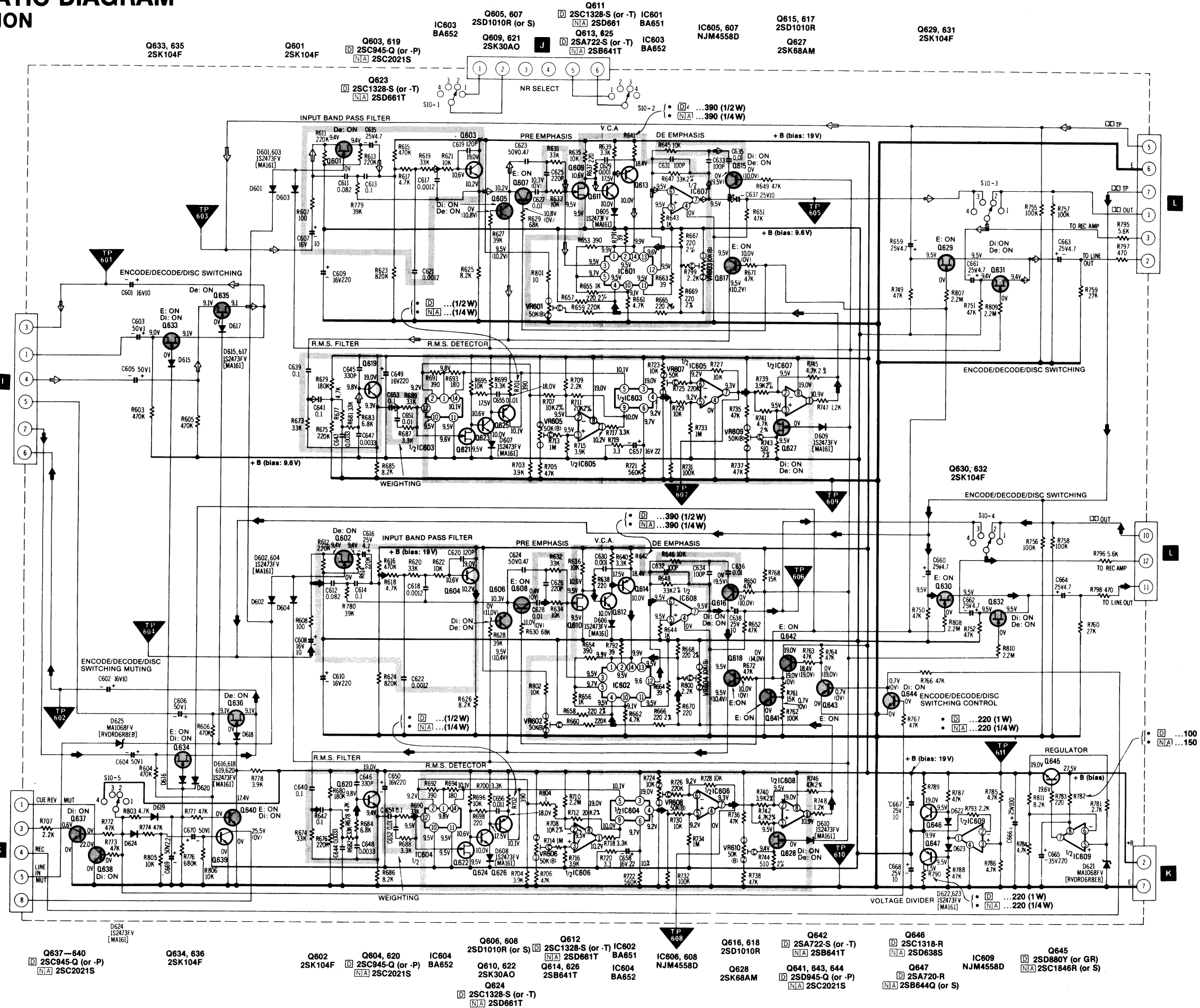
Q403

D	2SC945-Q (or -P)
F.A	2SD636R (or S)
C	around 3V
B	around 0.2V



# SCHEMATIC DIAGRAM

## dbx SECTION



IC601, 602

### NOTES:

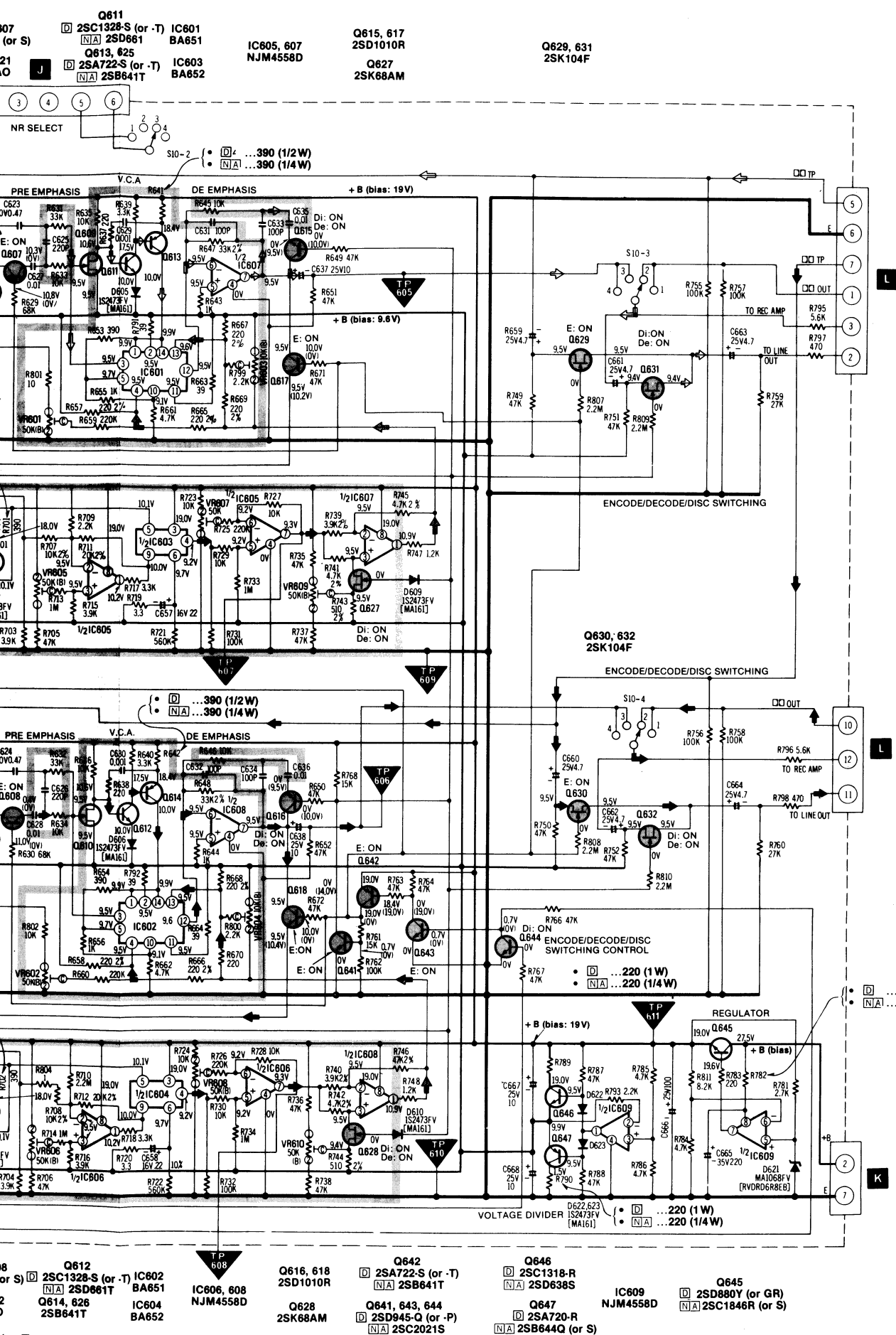
- S10-1—S10-5 ..... Noise reduction select switch (sh (1...Dolby IN, 2...OUT, 3...dbx tap
- VR601, VR602 ..... VCA distortion adjustment VR.
- VR603, VR604 ..... VCA distortion adjustment VR.
- VR605, VR606 ..... RMS distortion adjustment VR.
- VR607, VR608 ..... dbx standard input level adjustment VR.
- VR609, VR610 ..... dbx standard level adjustment VR.
- Resistance are in ohms ( $\Omega$ ), 1/4 watt unless specified.
- 1K = 1,000( $\Omega$ ), 1M = 1,000k( $\Omega$ ).
- Capacity are in microfarads ( $\mu$ F) unless specified or P = Pico-farads.
- The mark (V) shows test point. e.g. V = Test point 1.
- All voltage values shown in circuitry are under no signal control at minimum position.
- However, the voltage in playback mode is indicated mode.
- For measurement, use TVT.M.
- ( $\rightarrow$ ) this arrow indicates the flow of the playback.
- ( $\rightarrow$ ) this arrow indicates the flow of the recording.
- ( $\rightarrow$ ) this arrow indicates the flow V.C.A. control.
- Described in the schematic diagram are two types of production parts number for transistors and diodes. One type of number is used for supply parts number identical.

e.g. Q605

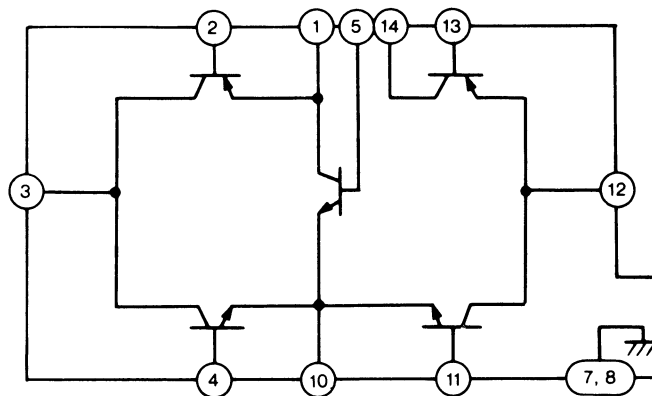
Supply parts number  
2SD1010RProduction parts number  
2SD1010R or 2SD1010SD605  
1S2473FV  
[MA161]  
Supply parts number

The supply parts number is described alone in the r

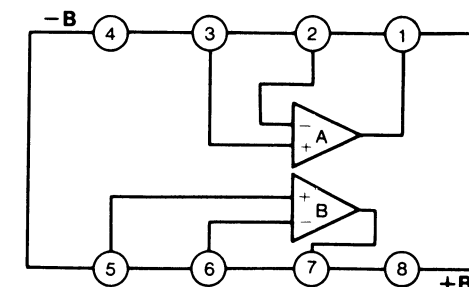
### EQUIVALENT CIRCUIT



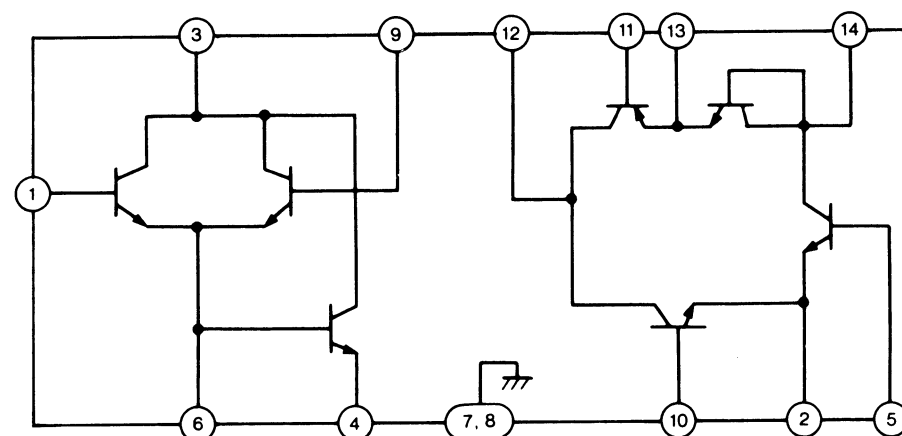
**IC601, 602**






**IC605, 606, 607, 608, 609**



## IC603, 604



**NOTES:**



- S10-1—S10-5 .....Noise reduction select switch (shown in OUT position).  
(1....Dolby IN, 2....OUT, 3....dbx tape, 4....dbx disc)
  - VR601, VR602 .....Dolby distortion adjustment VR.
  - VR603, VR604 .....VCA distortion adjustment VR.
  - VR605, VR606 .....RMS distortion adjustment VR.
  - VR607, VR608 .....dbx standard input level adjustment VR (Encode).
  - VR609, VR610 .....dbx standard level adjustment VR (Decode).
  - Resistance are in ohms ( $\Omega$ ), 1/4 watt unless specified otherwise.  
1K = 1,000( $\Omega$ ), 1M = 1,000k( $\Omega$ ).
  - Capacity are in microfarads ( $\mu$ F) unless specified otherwise.  
P = Pico-farads.
  - The mark (▼) shows test point. e.g. ▼ = Test point 1.
  - All voltage values shown in circuitry are under no signal condition and record mode with volume control at minimum position.
- However, the voltage in playback mode is indicated in ( ) when it differs from that in record mode.
- For measurement, use TVT.M.
- (  ) this arrow indicates the flow of the playback signal.
  - (  ) this arrow indicates the flow of the recording signal.
  - (  ) this arrow indicates the flow V.C.A. control signal.
- Described in the schematic diagram are two types of numbers; the supply parts number and production parts number for transistors and diodes.  
One type of number is used for supply parts number and production parts number when they are identical.

e.g. Q605 Supply parts number 2SD1010R

2SD1010R (or S) Production parts number 2SD1010R or 2SD1010S

D605  
1S2473FV Production parts number  
[MA161] Supply parts number

- The supply parts number is described alone in the replacement parts list.

- (2%) presents allowable resistance range of resistor used.  
e.g. R665 220 (2%)  $\rightarrow 220 \pm 4.4(\Omega)$
- Marks  and  represent the switching transistors for encode, decode and disc modes in the dbx circuit. ON modes of respective transistors are indicated by symbols as shown below. (They are OFF for other modes.)

e.g. "E.ON" shows ON condition during Encode mode. → 

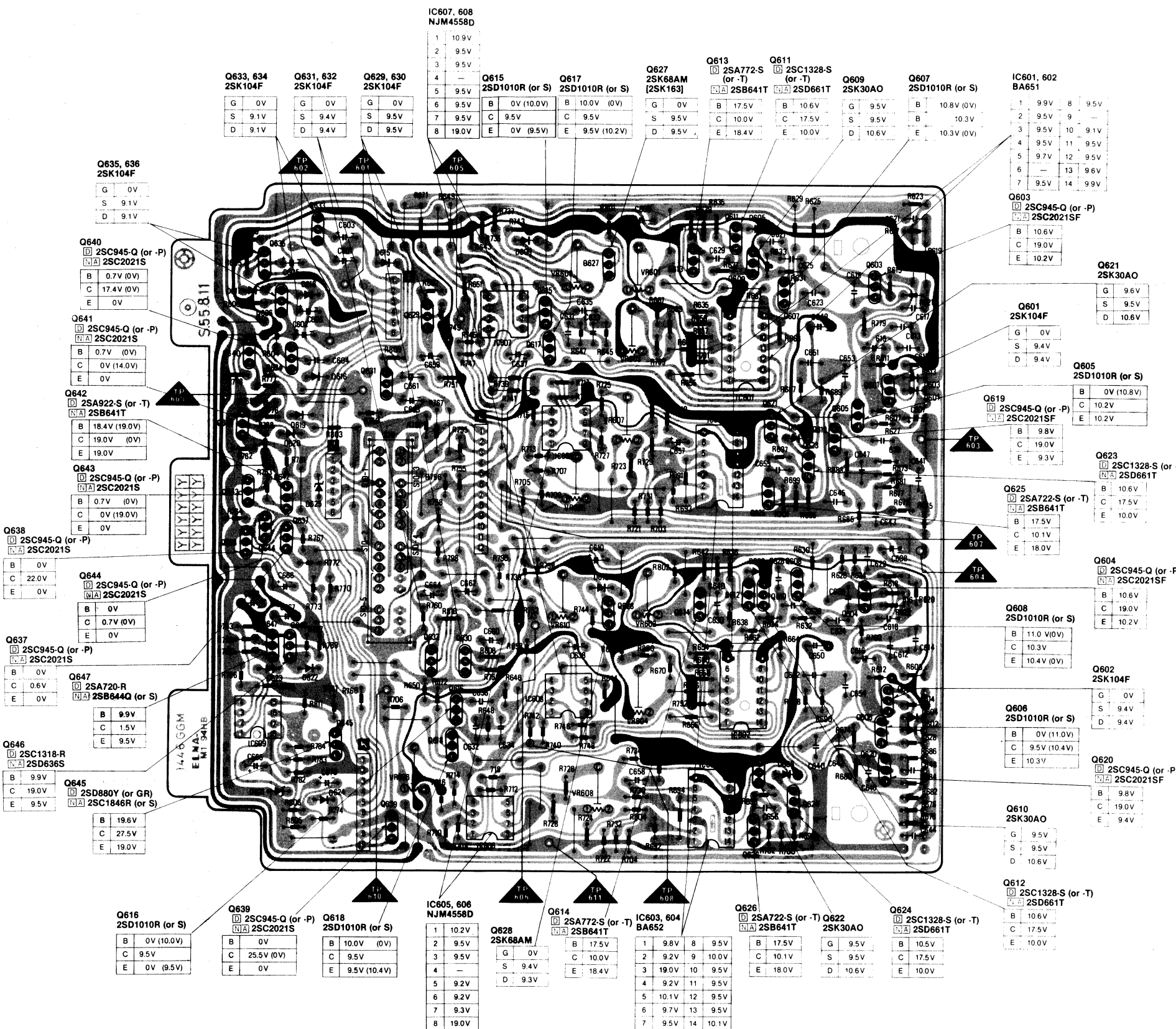
“De.ON” shows ON condition during Decode mode. → 

"Di.ON" shows ON condition during Disc mode. → 

- Circuit constructions for encoding, decoding and disc are different as shown in page 10.

- **D** ...For all European areas.
- **N** ...For Asia, Latin America, Middle East, and Africa areas.
- **A** ...For Australia.

# dbx CIRCUIT BOARD



## NOTES:

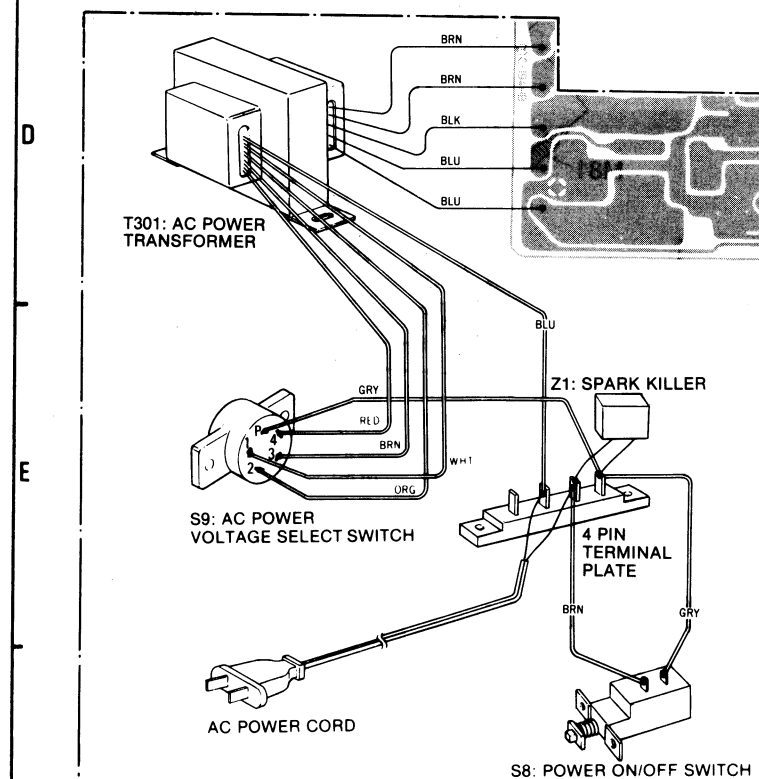
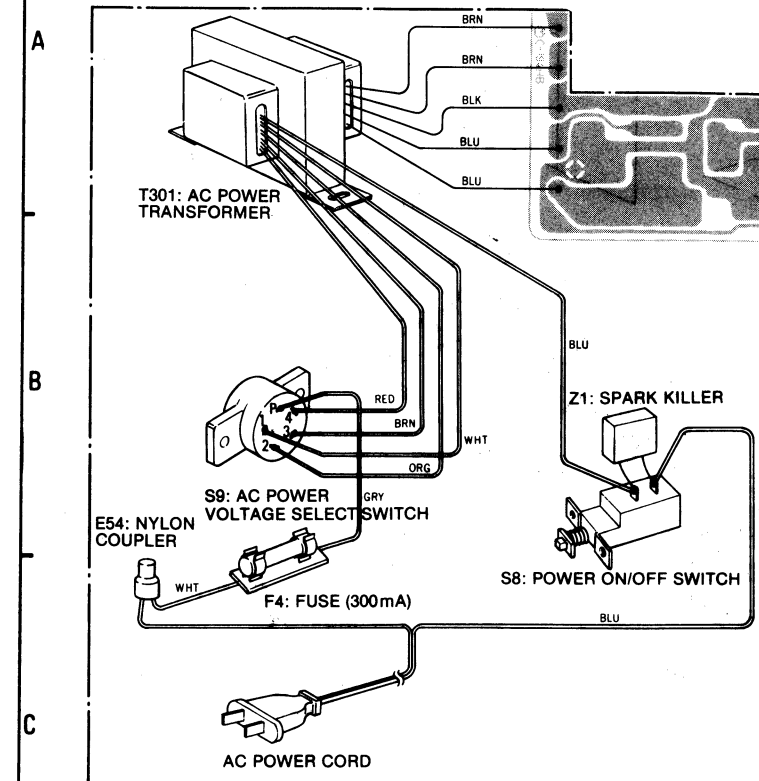
- The circuit shown in on the conductor is +B (bias: 19V) circuit.
- The circuit shown in on the conductor is +B (bias: 9.6V) circuit.
- The circuit shown in on the conductor indicates printed circuit on the back side of the printed circuit board.
- Values indicated in are under no signal condition and record mode with volume control at minimum position. However, the voltage in playback mode is indicated in ( ) when it differs from that in record mode. For measurement, use VTVM.

- Described in the circuit board diagram are two types of numbers; the supply parts number and production parts number for transistors. One type of number is used for supply parts number and production parts number when the are identical.

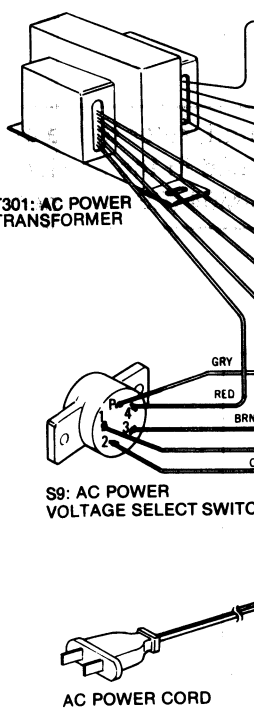
e.g. Q605      Supply parts number  
2SD1010R  
                 Production parts number  
2SD1010R or 2SD1010S

- The supply parts number is described alone in the replacement parts list.

## WIRING CONNECTION DIAGRAM



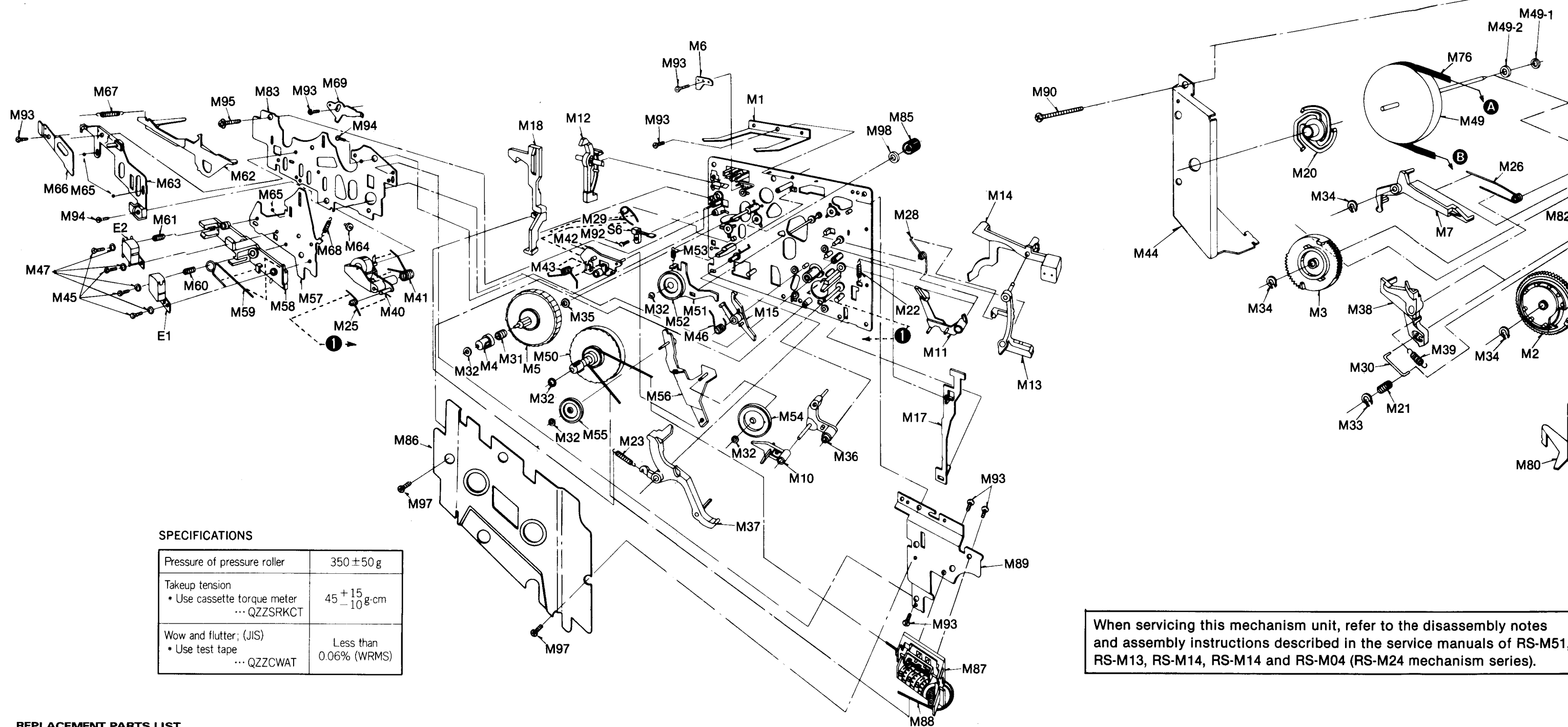
## HEADPHONES JACK CIRCUIT BOARD







## MECHANICAL PARTS LOCATION



## SPECIFICATIONS

Pressure of pressure roller	350 ± 50 g
Takeup tension * Use cassette torque meter ... QZZSRKCT	45 $\pm$ 15 - 10 g-cm
Wow and flutter; (JIS) * Use test tape ... QZZCWAT	Less than 0.06% (WRMS)

When servicing this mechanism unit, refer to the disassembly notes and assembly instructions described in the service manuals of RS-M51, RS-M13, RS-M14, RS-M14 and RS-M04 (RS-M24 mechanism series).

## REPLACEMENT PARTS LIST

Ref. No.	Part No.	Part Name & Description	Ref. No.	Part No.	Part Name & Description	Ref. No.	Part No.	Part Name & Description	Ref. No.	Part No.	Part Name & Description	Ref. No.	Part No.	Part Name & Description	Ref. No.	Part No.	Part Name & Description
<b>MECHANICAL PARTS</b>			M17	QMR1821	Auto-Stop Connection Rod	M34	XUB3FT	Stop Ring 3φ	M49-2	QBW2026	Snap Ring	M67	QBT1597	Brake Arm Spring	M83	QMK1838	Upper Base Plate
M1	QBP1874	Cassette Pressure Spring	M18	QMR1822	Eject Rod	M35	QBW2012	Poly Washer	M50	QXD1143	Takeup Reel Table Assembly	M68	QBT1892	Head Release Spring	M85	QDP1828	Fast Forward Pulley
M2	QDG1201	Main Gear	M19	QMR1824	Control Rod	M36	QXL1354	Sub Lever Assembly	M51	QXL1382	Idle Lever Assembly	M69	QMA3858	Head Adjustment Plate	M86	QXH0327	Chassis Cover Assembly
M3	QDG1202	Sub Gear	M20	QMZ1239	Flywheel Thrust Retainer	M37	QXL1355	Main Lever Assembly	M52	QXI0111	Takeup Idler Assembly	M70	QXG1047	Takeup Gear Assembly	M87	QXA1088S	Tape Counter
M4	QMB1336	Supply Reel Table Hub	M21	QBC1357	Lock Pin Pressure Spring	M38	QML3582	Pause Lock Lever	M53	QBT1893	Takeup Idler Spring	M71	QXU0170	Motor Assembly	M88	QDB0240	Counter Belt
M5	QDR1139	Supply Reel Table	M22	QBT1682	Auto-Stop Connection Rod Spring	M39	QBT1896	Lever Release Spring	M54	QXI0113	Fast Forward Idler Assembly	M72	QXK2286	Sub Chassis Assembly	M89	QMA3860	Counter Angle
M6	QMF2118	Fast Forward Arm Bracket	M23	QBT1894	Main Lever Spring	M40	QXL1381	Pressure Roller Assembly	M55	QXI0112	Rewind Idler Assembly	M73	QDG1199	Auto-Stop Gear			
M7	QML3581	Sub Control Lever	M24	QBN1739	Selection Lever Spring				M56	QXL1383	Fast Forward Arm Assembly	M74	QDG1200	Cam Gear	M90	XTN3+24B	Tapping Screw ⌀3×24
M8	QML3583	Main Control Lever	M25	QBN1742	Pressure Roller Release Spring	M41	QBN1743	Pressure Roller Spring	M57	QMK1840	Head Base Plate	M75	QDP1823	Connection Pulley	M91	XSN26+3	Screw ⌀2.6×3
M9	QML3584	Record Operation Lever	M26	QBN1744	Sub Gear Spring	M42	QML3588	Fast Forward Lever	M58	QMZ1241	Head Spacer	M76	QDB0281	Capstan Belt	M92	XTN2+6B	Tapping Screw ⌀2×6
M10	QML3586	Head Base Plate Lift Lever	M27	QBN1748	Main Gear Spring	M43	QBN1748	Fast Forward Spring				M77	QDB0274	Takeup Belt	M93	XTN26+6B	Tapping Screw ⌀2.6×6
			M28	QBN1802	Auto-Stop Lever Spring	M44	QMA4063	Flywheel Retainer	M59	QBN1740	Head Pressure Spring	M78	QDB0273	Fast Forward Belt	M94	XTN26+10B	Tapping Screw ⌀2.6×10
M11	QML3594	Auto-Stop Release Arm	M29	QBN1746	Connection Spring	M45	XSN2+10	Change Lever Spring	M60	QBC1278	Head Spring				M95	XTN26+12B	Tapping Screw ⌀2.6×12
M12	QML3603	Erase Safety Lever	M30	QBS1128	Lock Pin	M46	QBN1741	Change Lever Spring	M61	QBCA0008	"	M79	QXL1360	Record/Playback Selection Arm Assembly	M96	XTN3+10B	Tapping Screw ⌀3×10
M13	QML3604	Auto-Stop Driving Lever				M47	XWG2	Washer 2φ	M62	QML3591	Brake Arm				M97	XTN26+6BFZ	Tapping Screw ⌀2.6×6
M14	QML3605	Auto-Stop Detection Lever	M31	QBC1372	Reel Table Spring	M48	QML21254	Cord Clamp	M63	QMZ1240	Sub Head Base Plate	M80	QML3580	Record/Playback Selection Lever	M98	QBW2085	Poly Washer
M15	QML3592	Change Lever	M32	QBW2008	Poly Washer	M49	QXF0164	Flywheel Assembly	M64	QMN2550	Roller	M81	QBT1895	Record/Playback Selection Lever Spring			
M16	QMR1820	Record Rod	M33	XUB4FT	Stop Ring 4φ	M49-1	QBW2049	Poly Washer	M65	QDK1017	Steel Ball 2φ	M82	QXP0607	Fast Forward Connection Pulley Assembly			
									M66	QBP1873	Head Base Plate Pressure Spring						

